FERROMANGANESE DEPOSITS OF THE NORTH PACIFIC

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Abstract:

A compilation of existing data on distribution and composition of ferromanganese deposits of the North Pacific is presented. The information is overprinted on maps showing sedimentary provinces of the ocean. By doing this, several interesting relationships appear and suggest a tie between nodule distribution, metal content and properties of substrate.

Nodules occur within regions of extremely slow sedimentation of red clay and siliceous (Radiolarian) ooze and clay. They are most common in the Radiolarian ooze and clay comprising a 500-mile wide deposit stretching from Central America westward to the Marshall Islands.

Data on metal contents of nodules reveal those taken from siliceous or Radiolarian deposits of the Equatorial Pacific are twice as rich in Ni and Cu as the ones from red clays.

Properties of the siliceous ooze include very high porosity (88%) and moisture content (336%). These and other physical properties of the substrate show a correlation with high Ni, Cu and Mn content of nodules. Additional data is needed from the radiolarian oozes and associated nodules to confirm these relationships and to determine their significance in genesis and exploitation of the nodules.

CONTENTS

INTRODUCTION

A considerable volume of data related to properties and uses of the ocean floor are stored at oceanographic institutions throughout the world. Current interest in exploitation of the seabed has resulted in pressure from industry to have these data published. In this report the authors have compiled information available to them concerning ferromanganese deposits on the floor of the North Pacific Ocean. Chemical analyses of nodules and crusts are included as well as wet density, porosity, moisture content and texture of surface sediments.

The report is in three parts: 1) A brief statement about sampling methods and results obtained; 2) Three tables listing data available on ferromanganese deposits and their substrate; and 3) A set of maps showing the distribution and properties of ferromanganese deposits.

METHODS

Lamont-Doherty has recovered 775 piston cores from the North Pacific using an 1,800-lb coring head mounted on a core pipe with a 2.5-in. ID. The average length of core recovered in the North Pacific is 25 ft. Using these data it is possible to define the boundaries of major sedimentary provinces. The final decision as to which province a core belonged was based on the dominant sediment, not on the lithology of the surface deposit. The surface or capping layer of cores is often only a few inches thick and may not represent the prevailing sediment of a region. For this reason Map 1 differs from recent maps prepared by Fraser et al. (1972).

The distribution of ferromanganese deposits rests on sources of information given in Tables 1 and 2. The list of chemical analyses includes unpublished and published data on file at Lamont-Doherty, material from Scripps Institution of Oceanography obtained through the National Oceanographic Data Center, and results published in the literature.

Measurements of physical and textural properties of abyssal sediments given in Table 3 were conducted by the authors and are part of a data bank on ocean sediments at Lamont-Doherty. Bulk properties were determined using Beckman Manual Pycnometers on samples taken from cores when they were freshly extruded on deck. The samples were stored in plastic vials and flown back to the laboratory. Formulas used to determine the properties are:

$$\text{Wet Density} = \frac{\text{Wet weight}}{\text{Wet volume}}$$

$$\text{Porosity (\%)} = \frac{\text{Volume salt water}}{\text{Wet volume}} \times 100$$

$$\text{Moisture Content (\%)} = \frac{\text{Wet weight} - \text{Dry weight}}{\text{Dry weight} - \text{Salt weight}} \times 100$$

$$\text{Void Ratio} = \frac{\text{Volume salt water}}{\text{Dry volume}}$$

Grain size was determined using the combined sieve-pipette technique of Folk (1968).

Considerable emphasis has been placed on showing the results visually on maps. This has been done to keep the report brief yet informative.

SEDIMENTARY PROVINCES

Sediments of the North Pacific are best described if grouped in three categories: 1) terrigenous, 2) pelagic, and 3) material derived from topographic highs.

Terrigenous Sediments:

Land-derived or terrigenous deposits include gray and gray-green silts, muds and clays of the continental margin along with graded sands and silts laid down by turbidity currents. Seaward dispersal of sediment in the North Pacific is greatly restricted by an almost continuous line of barriers (island arcs) and deeps (trenches) at the periphery of the ocean. As a result, terrigenous deposits form a narrow ribbon of sediment 150 to 180 miles wide around the limits of the basin (Map 1). There is one area where coarse material penetrates the basin; this is in deep water off Oregon. Here sediment delivered to the coast by the Columbia River is resuspended offshore and carried by turbidity currents 1400 miles seaward of the continental rise.

Pelagic Sediments:

The second group of sediments includes the extensive pelagic deposits. They cover three-fourths of the area of the North Pacific and include biogenic debris and red clays. The pelagic sediments lie in broad east-west zones which traverse the Pacific and generally coincide with major current systems and depth zones (Map 1).

Lying farthest north are biogenic oozes (mainly diatomaceous), ice-rafted detritus, and volcanic silt. The width of these deposits varies from 390 miles to 850 miles (Map 1).

Immediately to the south is red clay covering an area equal to half the North Pacific. The red clay province is 5,000 miles long and ranges from 1,300 to 1,700 miles wide. Sediment is extremely uniform both laterally and vertically and has a mean particle size of less than a micron. Manganese micronodules, occasional volcanic ejecta, and fish teeth are associated with the clay.

The zone of siliceous ooze and clay lying immediately south of the red clay is made up of the remains of Radiolaria. These one-celled animals secrete a shell of opaline silica in the form of hollow, transparent, perforated spheres. Upon death, the skeleton sinks to the bottom and is added to billions of others already there. The tiny structures now form a deposit 500 miles wide and 4,500 miles long (Map 1).

Along the equator is a 450-mile wide band of chalk and calcareous ooze composed of the remains of Foraminifera. These lime deposits extend from Central America to the western limit of the North Pacific Basin (Map 1).

Sediment Derived from Topographic Highs:

The last sediment type includes all material derived from submarine topographic highs. It generally takes the form of volcanic or carbonate debris which has been transported downslope by normal bottom currents, slumping, or turbidity currents (Horn et al., 1970). Distribution of the deposits reflects the location of major topographic elements (Map 1).

DISTRIBUTION OF FERROMANGANESE DEPOSITS

On Map 2 are shown locations at which ferromanganese crusts and nodules have been recovered. Sources of information are listed in Table 1.* Most data points are the result of dredging and coring operations of Scripps Institution of Oceanography and Lamont-Doherty Geological Observatory.

Map 2 reveals the areas of terrigenous sedimentation along continental margins and island arcs; sites of turbidite deposition; the northern zone of biogenic siliceous material; regions of sedimentation on aprons around topographic highs; and areas of calcareous deposits at the equator are generally barren of nodules. These provinces are sites of relatively rapid sedimentation, which precludes development of nodules. Crusts do occur on rock exposures associated with sea-mounts and along fracture zones. However, they are considered to form under a set of conditions distinct from those of deep-water nodules.

The great majority of nodules occur within the red clays and narrow band of siliceous ooze. Both are characterized by very low rates of sedimentation (i.e., red clay less than 1 mm/1,000 yrs - Opdyke and Foster, 1970; and Radiolarian ooze at 3.5 mm/1,000 yrs - Hays et al., 1969). From data given in Map 2 nodules seem most abundant between 6° 30'N and 17°N which are the approximate boundaries of radiolarian oozes and radiolarian clays.

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* Data of the U.S.S. NERO was collected using a sounding cup with only a 12-mm opening through which the bottom sediment could pass. In addition, sample descriptions did not distinguish between a nodule and crust. For these reasons it was decided not to plot the results on Map 2. However, information about these samples is included in Table 1.

NICKEL, COPPER AND COBALT CONTENT OF NODULES

In sections dealing with metal values, the reader understands that the average values of the metals for the nodules are a synthesis of the results of several workers who used a variety of analytical methods. The averages are used here to show trends, knowing that individual analyses may not be directly comparable. The trend of the metals are identified, and the reader can then refer to the tables and determine to his own satisfaction whether or not specific results are valid or invalid.

Chemical analyses of some nodules from red clays and several from radiolarian sediments are shown on Map 3. Results indicate the average analysis for red clays is .76% Ni, .50% Cu, and .28% Co. On the other hand, nodules from siliceous oozes have average values of 1.16% Ni, 1.02% Cu, and .25% Co.

The averages of the metals indicate nodules from radiolarian oozes of the southern siliceous zone contain nearly twice as much nickel and copper as their counterparts from red clays. It seems that if nodules were equally abundant in both provinces, industry's interest would lie only in those high in Ni and Cu from the radiolarian sediments.

IRON, MANGANESE AND CALCIUM CONTENT OF NODULES

Iron, manganese and calcium contents of nodules are given on Map 4. Nodules from regions of red clays are higher in iron (average 11.45%) than those from ooze (average 8.15%). Manganese content of of nodules from red clays (average 17.43%) is lower than those from siliceous ooze (average 22.36%). Calcium determinations indicate nearly equal values in both provinces.

Map 4 reveals these trends quite impressively. The left-hand column of the histogram represents the value for iron. There is a progressive increase of iron content from south to north. Manganese, on the other hand, is represented by the center column and is high within the siliceous oozes and shows a pronounced drop within the red clay regions.

PHYSICAL PROPERTIES OF THE SUBSTRATE

Textural and physical properties of red clays and siliceous oozes from the floor of the North Pacific are listed in Table 3. This information has been drawn from the Lamont-Doherty data bank of physical properties of ocean sediments. Results are for surface sediments only (Map 5).

Red clays have an average wet density of 1.49 g/cc, whereas that of siliceous ooze is 1.18 g/cc. Values of porosity and moisture content are extraordinary. Average porosity of red clay is 77%, which is high in itself; however, it is even higher for siliceous ooze with an average porosity of 88%. Average moisture content of the samples of red clay is 126%, siliceous ooze 336%. The very high porosity and moisture content of the southern siliceous oozes is due to the properties of the skeletal grains comprising the deposit.

Radiolarian ooze of the Equatorial Pacific appears to be one of the most porous materials on the ocean floor. Its high porosity is due in part to spines on the outer surfaces of the Radiolaria which hold the framework grains apart. This results in high interstitial porosity. Added to this is the hollow skeleton with porous walls which many Radiolaria possess. When dry, the ooze is similar to a foam or froth, ex-

tremely porous and with the capacity to filter or hold large volumes of water. It is speculated that these properties may assist in vertical flushing of metals through the sediment column (see Raab, 1972) and be of primary importance to genesis of nodules high in nickel and copper.

Several hundred textural analyses of red clay indicate its average particle size is less than a micron. Scant data on Radiolarian oozes give a mean grain size of 1 to 2 microns.

CONCLUSIONS

Sedimentary provinces of the North Pacific have been outlined and compared with the distribution of nodular ferromanganese deposits and their metal content. Nodules occur within provinces of red clay and radiolarian-bearing sediments. This relation suggests that an extremely low rate of deposition is a primary control on the development and distribution of nodules.

Existing data on metal contents of nodules reveal that those taken from the Radiolarian deposits of the Equatorial Pacific are twice as rich in Ni and Cu as the red clays to the north. The nodules from both provinces have similar amounts of Co and Ca, and those from red clay provinces are richer in Fe. From these results it would seem that the nodule deposits from the southern siliceous oozes offer most promise to those interested in exploitation of nodules as a source of metals.

Information on the physical properties of the substrate suggest that there is a correlation between the highly porous Radiolarian ooze and nodules rich in Ni, Cu and Mn. More data is needed to verify this relationship and to determine its meaning in the distribution and genesis of the nodules.

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REFERENCES

Folk, R. L., 1968, Petrology of sedimentary rocks: Austin, Texas, Hemphill's, 170 p.

Fraser, J. Z., Hawkins, D. L., Hydock, L., Crocker, W. L., Schoenbechler, M., Newhouse, D. A., and Chase, T. E., 1972, Surface sediments and topography of the North Pacific: Geologic Data Center, Scripps Institution of Oceanography, 10 charts.

Hays, J. D., Saito, T., Opdyke, N. D., and Burckle, L. H., 1969, Pliocene-Pleistocene sediments of the Equatorial Pacific — their paleomagnetic, biostratigraphic and climatic record: Geol. Soc. America Bull., v. 80, p. 1481-1514.

Horn, D.R., Horn, B.M., and Delach, M.N., 1970, Sedimentary provinces of the North Pacific: Geol. Soc. America Mem. 126, p. 1-22.

Opdyke, N.D., and Foster, J.H., 1970, Paleomagnetism of cores from the North Pacific: Geol. Soc. America Mem. 126, p. 83-119.

Raab, Werner, 1972, Physical and chemical features of Pacific deep sea manganese nodules and their implications to the genesis of nodules: Paper presented at Ocean Manganese Conference sponsored by National Science Foundation (I. D. O. E.), January, (in press).

TABLE I

CORE AND DREDGE SAMPLES CONTAINING FERROMANGANESE DEPOSITS

FOREIGN AND DOMESTIC EXPEDITIONS

NORTH PACIFIC

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
010	06°31'N	92°52'W	3,563	Lamont V18-345	Corer (piston)	Lamont
010	08°49'N	97°16'W	3,799	Lamont V18-341	Corer (piston)	Lamont
010	07°52'N	97°39'W	3,484	Lamont RC13-132	Corer (piston)	Lamont
011	07°44'N	101°21'W	3,288	Lamont V20-20	Corer (piston)	Lamont
011	06°52'N	104°08'W	3,446	Lamont V20-24	Corer (piston)	Lamont
011	09°24'N	105°54'W	3,206	Lamont V18-325	Corer (piston)	Lamont
012	09°19'N	110°33'W	3,630	Lamont RC10-79	Corer (piston)	Lamont
012	06°38'N	110°56'W	4,316	Lamont RC10-76	Corer (piston)	Lamont
012	06°53'N	111°06'W	972	Lamont RC10-78	Corer (piston)	Lamont
012	07°15'N	111°21'W	4,136	Lamont RC10-77	Corer (piston)	Lamont
012	09°26'N	113°16'W	3,700	Scripps Carr-5		Barnes & Dymond, 1967
012	07°33'N	114°29'W	3,946	Lamont V20-28	Corer (piston)	Lamont
012	01°27'N	116°13'W	4,000	Scripps DWBG-147	Corer (gravity)	Scripps, 1958
012	05°20'N	117°55'W	4,330	Scripps Ris-14V	Corer (heat probe)	Scripps, 1962
012	09°59'N	118°00'W	4,295	Scripps DWHG-92	Corer (gravity)	Scripps, 1958
013	08°31'N	120°09'W	3,389	Lamont V20-31	Corer (piston)	Lamont
013	06°46'N	122°57'W	4,508	Lamont V21-199	Corer (piston)	Lamont
013	08°53'N	123°32'W	4,497	Lamont V20-33	Corer (piston)	Lamont

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
013	07°18'N	125°20'W	4,610	Lamont RC10-93	Corer (piston)	Lamont
013	08°09'N	125°20'W	4,360	Scripps Cb-39	Corer	Mero, 1965
013	08°05'N	125°25'W	4,453	Scripps Cb-17	Corer	Mero, 1965
013	07°41'N	125°37'W	4,416	Scripps Cb-19	Corer	Mero, 1965
013	08°01'N	126°58'W	4,440	Scripps Cb-34	Corer (gravity)	Scripps 1952-53
014	08°38'N	130°11'W	4,890	Lamont V21-197	Corer (piston)	Lamont
014	08°48'N	130°48'W	4,917	Scripps DWBG-7	Corer	Scripps 1957-58
014	09°48'N	136°01'W	4,813	Lamont V21-D14	Trawl (biology)	Lamont
014	09°50'N	136°23'W	4,823	Lamont RC12-58	Corer (piston)	Lamont
014	08°59'N	137°41'W	4,660	Lamont RC12-59	Corer (piston)	Lamont
014	09°57'N	137°47'W	4,930	Harvard Alb-13	Trawl (Blake)	Murray & Lee, 1909
014	09°57'N	137°47'W	4,930	2P-52	Dredge	Cronan & Tooms, 1969
014	00°50'N	137°54'W	4,510	Harvard Alb-17		Menard, 1964
014	08°47'N	139°53'W	5,086	Lamont RC11-206	Corer (piston)	Lamont
014	08°47'N	139°53'W	5,086	Lamont RC11-D21	Dredge (pebble)	Lamont
015	08°25'N	142°42'W	5,007	Scripps JynV-36	Corer (piston)	Scripps 1961
015	09°06'N	145°18'W	5,400	Scripps Msn-148G	Corer (gravity)	Scripps 1961
015	07°17'N	148°12'W	4,925	Scripps JynV-20	Corer (piston)	Scripps 1961

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
015	03°14'N	148°29'W	4,777	Lamont RC12-67	Corer (piston)	Lamont
015	06°05'N	148°52'W	5,036	Scripps JynV-17	Corer (gravity)	Scripps 1961
015	06°33'N	148°59'W	4,508	Lamont RC12-68	Corer (piston)	Lamont
015	09°13'N	149°49'W	5,073	Lamont RC12-69	Corer (piston)	Lamont
015	08°02'N	149°54'W	5,073	Scripps JynV-15PG	Corer	Scripps 1961
015	09°54'N	149°57'W	5,304	Scripps Stx-10FF	Grab	Scripps 1968
016	09°20'N	150°35'W	4,813	Scripps JynV-14G	Corer (gravity)	Scripps 1961
016	09°27'N	150°42'W	5,100	Scripps JynV-13G	Corer (gravity)	Scripps 1961
016	08°59N	152°50'W	4,839	Scripps Wah-4PG	Corer	Cronan & Tooms, 1969
016	08°16'N	153°01'W	5,143	Scripps Wah-24FF8	Corer	Cronan & Tooms, 1969
016	07°55'N	153°42'W		USSR Vit-5124		Skornyakova et al., 1968
016	00°00'N	159°53'W	5,163	USSR Vit-5429	Dredge	Skornyakova et al., 1968
017	08°53'N	164°26'W	4,925	Lamont RC13-56	Corer (piston)	Lamont
017	09°57'N	167°51'W	5,280	Scripps Dodo-20C	Corer (camera)	Scripps 1964
017	07°47'N	168°00'W	4,994	Scripps Msn-J	Corer	Mero 1965
017	07°36'N	168°06'W	4,994	Scripps Msn-10G	Corer (gravity)	Scripps 1960-61
017	09°41'N	168°42'W	5,222	Lamont RC12-195	Corer (piston)	Lamont

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
017	09°20'N	168°50'W	5,240	Scripps Dodo-25PG	Corer	Scripps 1964
017	08°34'N	168°52'W	4,397	Scripps Proa-151G	Corer	Scripps 1962
017	09°00'N	169°00'W	5,170	Scripps Dodo-27G	Corer (gravity)	Scripps 1964
017	06°04'N	169°58'W	5,400	Scripps Msn-11G	Corer (gravity)	Scripps 1960-61
018	06°03'N	170°00'W	5,400	Scripps Msn-K	Corer	Mero 1965
018	08°06'N	170°25'W	5,444	Scripps Proa-139G	Corer (gravity)	Scripps 1962
018	08°33'N	170°59'W	5,169	Lamont RC13-19	Corer (piston)	Lamont
018	09°49'N	170°59'W	4,875	Scripps LSDH-93PG	Corer (gravity)	Scripps 1962-63
018	07°04'N	171°42'W	5,386	Scripps Proa-137G	Corer	Scripps 1962
018	07°19'N	175°28'W	5,190	Scripps LSDH-90PG	Corer	Scripps 1962-63
018	09°46'N	175°37'W	5,760	Lamont RC12-197	Corer (piston)	Lamont
018	08°08'N	177°10'W	5,435	Scripps LSDH-89PG	Corer	Scripps 1962-63
018	09°42'N	177°59'W	5,953	Lamont RC12-198	Corer (piston)	Lamont
018	06°02'N	178°35'W	5,097	Scripps Proa-101PG	Corer	Scripps 1962
018	00°15'N	179°43'W	5,045	Scripps Proa-105G	Corer	Scripps 1962
019	09°17'N	178°57'E	5,821	Lamont V24-D1	Dredge (rock)	Lamont
019	09°17'N	178°37'E	5,704	Lamont V24-79	Corer (piston)	Lamont
019	09°19'N	177°59'E	5,698	Scripps Nv-A-7G	Corer (gravity)	Scripps 1967

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
019	08°19'N	176°25'E	5,097	Lamont V24-102	Corer (piston)	Lamont
019	01°28'N	174°52'E	4,691	Lamont RC12-200	Corer (piston)	Lamont
020	06°40'N	163°11'E	4,921	Lamont V19-101	Corer (piston)	Lamont
022	00°40'N	148°41'E	4,860	M-285		Menard 1964
023	06°08'N	136°11'E	4,600	Scripps Proa-11P	Corer	Scripps 1962
023	04°57'N	135°30'E	4,580	USSR Vit-3996	Trawl	Skornyakova et al., 1962
023	04°19'N	130°15'E	4,670	M-273		Menard 1964
046	11°34'N	96°45'W	4,330	Lamont RC13-131	Corer (piston)	Lamont
046	13°02'N	97°04'W	3,888	Lamont RC13-D1	Dredge (rock)	Lamont
046	12°30'N	97°36'W	3,660	USC&GS Expl-18	Corer (gravity)	NODC 1971
046	12°30'N	97°36'W	3,660	USC&GS Expl-60-6	Corer	Scripps 1960
047	11°38'N	101°20'W	3,197	Lamont V18-330	Corer (piston)	Lamont
047	11°04'N	102°17'W	3,191	Lamont V18-329	Corer (piston)	Lamont
047	11°38'N	103°48'W	3,500	Scripps Acap-10	Corer	Mero 1965
047	10°53'N	105°07'W	3,275	Scripps Acap-11	Corer	Mero 1965
047	15°06'N	107°09'W	3,891	Lamont RC10-82	Corer (piston)	Lamont
047	10°39'N	108°45'W	5,276	Scripps CarrII-9D	Dredge (bucket)	Scripps 1964
048	16°39'N	110°13'W	3,660	Lamont RC10-88	Corer (piston)	Lamont

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
048	14°28'N	111°50'W	3,644	Scripps Tri-7Go	Corer	Scripps 1966
048	19°39'N	113°44'W	4,000	Ken-6A		Ku & Broecker 1969
048	11°25'N	113°48'W	4,085	Swed. Deep Sea SDSE-48	Corer	Arrhenius 1952
048	19°20'N	114°12'W	3,480	Trans-14D	Corer	Mero 1965
048	16°37'N	114°31'W	3,598	Lamont RC10-240	Corer (piston)	Lamont
048	19°46'N	114°44'W	3,438	Trans-14C	Corer	Mero 1965
048	14°26'N	117°12'W	4,125	Scripps RIS-8V	Corer (heat probe)	Scripps 1961-62
048	11°28'N	117°38'W	4,300	Scripps RIS-10V	Corer (heat probe)	Scripps 1961-62
048	13°20'N	117°58'W	4,248	Swed. Deep Sea SDSE-50A	Corer	Arrhenius 1952
048	18°20'N	119°03'W	3,275	Lamont RC10-239	Corer (piston)	Lamont
048	19°52'N	119°53'W	4,226	Lamont RC12-47	Corer (piston)	Lamont
049	12°16'N	120°10'W	4,471	Lamont RC10-91	Corer (piston)	Lamont
049	19°48'N	120°16'W	4,104	USSR Vit-4279	Trawl (camera)	Menard 1964
049	18°41'N	120°36'W	4,006	Lamont RC10-238	Corer (piston)	Lamont
049	19°49'N	121°44'W	4,138	UNK-RR	Dredge	Mero 1965
049	19°00'N	121°53'W	4,138	Scripps Cb-1	Corer (gravity)	Scripps 1952-53
049	19°59'N	121°59'W	4,370	USSR Vit-4281	Trawl	Skornyakova et al., 1962

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
049	14°55'N	124°12'W	4,270	Scripps Cap-50B	Corer	Scripps 1952-53
049	17°09'N	124°36'W	4,321	Lamont RC12-49	Corer (piston)	Lamont
049	16°03'N	125°01'W	4,354	Scripps Cb-2	Corer (gravity)	Scripps 1952-53
049	15°04'N	125°05'W	4,500	Scripps Amp. 3PG	Corer	Scripps 1963-64
049	15°00'N	125°26'W	4,380	Scripps Cb-3	Corer	Mero 1965
049	10°19'N	125°27'W	4,545	Scripps Cb-9	Corer	Mero 1965
049	13°03'N	125°29'W	4,440	Scripps Cb-5	Corer (gravity)	Scripps 1952-53
049	16°35'N	125°35'W	4,369	Lamont RC12-50	Corer (piston)	Lamont
049	19°57'N	126°06'W	4,545	USSR Vit-4285	Corer (camera)	Menard 1964
049	15°09'N	127°41'W	4,660	Lamont RC12-51	Corer (piston)	Lamont
049	11°05'N	128°34'W	4,770	Scripps DWHH-7	Dredge	Scripps 1958
049	10°37'N	128°54'W	4,636	Lamont V20-D1	Dredge (rock)	Lamont
050	10°26'N	130°28'W	4,890	Scripps DWBD-2	Dredge	Scripps 1958
050	18°16'N	131°46'W	5,210	Scripps JynV-50PG	Corer	Cronan & Tooms, 1969
050	11°24'N	132°07'W	4,843	Lamont V20-36	Corer (piston)	Lamont
050	14°22'N	133°07'W	4,816	Scripps MP-5	Corer	Scripps 1950
050	15°54'N	133°57'W	4,606	Scripps JynV-48PG	Corer	Scripps 1961
050	14°05'N	134°11'W	2,327	Lamont RC15-13	Corer (piston)	Lamont

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
050	12°18'N	135°25'W	4,885	Lamont V20-38	Corer (piston)	Lamont
050	14°38'N	136°44'W	4,850	Harvard Alb-11		Menard 1964
050	16°15'N	137°06'W	4,553	Scripps Car-78	Snapper	Fleming et al., 1945
050	12°07'N	137°18'W	5,280	Harvard Alb-12		Menard 1964
050	12°40'N	137°32'W	4,918	Scripps Car-79	Snapper	Fleming et al., 1945
050	13°07'N	138°56'W	4,927	Scripps Msn-153PG	Corer	Scripps 1960-61
050	10°45'N	139°24'W	4,770	Lamont V21-D13	Trawl (biology)	Lamont
050	11°01'N	139°58'W	4,877	Lamont RC11-D20	Dredge (pebble)	Lamont
051	19°29'N	140°02'W	5,574	Lamont RC11-D18	Dredge (pebble)	Lamont
051	14°52'N	140°02'W	4,828	Lamont RC11-D19	Dredge (pebble)	Lamont
051	14°28'N	141°11'W	4,909	Lamont V20-D2	Dredge (rock)	Lamont
051	10°59'N	142°37'W	4,978	Scripps Msn-150G	Corer (gravity)	Scripps 1960-61
051	15°03'N	142°46'W	4,526	Lamont V20-44	Corer (piston)	Lamont
051	13°31'N	143°01'W	5,233	Scripps Stx-8FF	Grab	Scripps 1968
051	19°46'N	144°14'W	3,488	USC&GS Expl-14b	Corer	Mero 1965
051	14°11'N	144°28'W	4,896	Lamont V20-46	Corer (piston)	Lamont
051	11°55'N	144°54'W	5,539	Scripps JynV-31PG	Corer	Scripps 1961
051	12°19'N	145°08'W	5,550	Lamont V21-D11	Trawl (biology)	Lamont

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
051	14°26'N	145°21'W	4,640	Lamont V20-48	Corer (piston)	Lamont
051	12°02'N	145°46'W	5,330	Scripps Stx-9FF	Grab	Scripps 1968
051	14°25'N	145°52'W	4,618	Lamont V20-D4	Dredge (rock)	Lamont
051	13°10'N	147°45'W	5,610	Lamont V21-192	Corer (piston)	Lamont
052	13°44'N	150°00'W	5,218	Lamont V21-D9	Trawl (biology)	Lamont
052	14°04'N	150°37'W	5,563	Lamont RC12-71	Corer (piston)	Lamont
052	16°33'N	150°55'W	5,119	Lamont V20-52	Corer (piston)	Lamont
052	12°42'N	152°01'W	5,310	Challenger Chal-265	Dredge	Murray 1885
052	14°19'N	152°21'W	5,427	Lamont V21-190	Corer (piston)	Lamont
052	14°19'N	152°37'W	5,480	Challenger Chal-264	Trawl	Murray 1885
052	11°51'N	152°56'W	5,221	Scripps Wah-2PG	Corer	Scripps 1965
052	11°17'N	154°08'W		USSR Vit-5126		Skornyakova et al., 1968
052	14°19'N	154°48'W	5,272	Scripps Stx-13G	Corer	Scripps 1968
052	14°30'N	154°48'W	5,378	Scripps Stx-12G	Corer	Scripps 1968
052	15°49'N	157°04'W	5,233	Scripps Stx-25G	Corer	Scripps 1968
052	10°22'N	157°08'W	5,353	Lamont RC13-58	Corer (piston)	Lamont
053	15°51'N	160°37'W	5,550	Alpine G.A. BA-11-1	Corer	Alpine Geophys. Assoc., 1968
053	14°11'N	161°08'W	5,652	Scripps Msn-G	Corer	Mero 1965

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
053	14°09'N	161°08'W	5,652	Scripps Msn-7G	Corer (gravity)	Scripps 1960-61
053	15°02'N	162°31'W	5,666	Scripps Tet-24	Corer (gravity)	Scripps 1960
053	16°19'N	162°57'W	5,605	Swed. Deep Sea SDSE-80	Corer	Olausson 1960
053	16°57'N	163°00'W	5,773	Lamont RC12-192	Corer (piston)	Lamont
053	12°58'N	163°09'W	5,430	Scripps Tet-28	Corer (gravity)	Scripps 1960
053	13°05'N	163°10'W	5,413	Scripps Tet-27A	Corer	Scripps 1960
053	13°50'N	163°32'W	5,460	Lamont RC12-79	Corer (piston)	Lamont
053	11°01'N	164°56'W	4,835	Scripps Proa-148G	Corer (gravity)	Scripps 1962
053	14°28'N	164°59'W	5,455	Swed. Deep Sea SDSE-81	Corer	Olausson 1960
053	10°30'N	165°33'W	4,341	Scripps Proa-147V	Corer (heat probe)	Scripps 1962
053	16°06'N	165°45'W	2,400	Scripps Tet-22	Corer	Scripps 1960
053	16°05'N	165°52'W	5,295	Lamont RC12-193	Corer (piston)	Lamont
053	15°36'N	166°40'W	5,440	Scripps Proa-169G	Corer	Scripps 1962
053	12°16'N	166°48'W	5,080	Swed. Deep Sea SDSE-82	Corer	Kullenberg 1955
053	13°57'N	167°00'W	5,442	Lamont RC13-53	Corer (piston)	Lamont
053	11°59'N	167°02'W	5,176	Lamont RC13-52	Corer (piston)	Lamont
053	10°02'N	167°50'W	5,280	Scripps Dodo-20P	Corer (piston)	Scripps 1964
053	19°35'N	168°50'W	2,148	Scripps Stx-2D	Dredge	Scripps 1968

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
053	11°28'N	168°51'W	5,285	Scripps LSDH-95G	Corer (gravity)	Scripps 1962-63
053	19°07'N	169°44'W	1,740	Scripps MP-25F1	Dredge (chain bag)	Scripps 1950
053	19°07'N	169°44'W	1,741/ 1,786	Scripps MP-25F2	Dredge (chain bag)	Scripps 1950
054	10°23'N	170°57'W	4,469	Scripps Proa-156G	Corer (gravity)	Scripps 1962
054	19°25'N	171°00'W	1,320/ 1,410	Scripps MP-26A-3	Dredge (chain bag)	Hamilton 1956
054	19°30'N	171°00'W	1,250	Scripps MP-26A-1	Corer	Scripps 1950
054	19°30'N	171°00'W	1,240	Scripps MP-26A-2	Dredge (chain bag)	Hamilton 1956
054	19°30'N	171°00'W	1,290	Scripps MP-26B	Dredge (chain bag)	Hamilton 1956
054	12°59'N	171°05'W	5,546	Lamont RC13-18	Corer (piston)	Lamont
054	10°20'N	172°06'W	5,106	Scripps Proa-157G	Corer	Cronan & Tooms, 1969
054	11°23'N	172°47'W	5,380	Scripps Proa-159G	Corer (gravity)	Scripps 1962
054	12°16'N	172°48'W	2,708	Scripps Proa-161G	Corer	Scripps 1962
054	18°20'N	173°17'W	3,950	Scripps MP-32	Corer	Scripps 1950
054	17°54'N	174°16'W	1,770	Scripps MP-33D	Dredge	Scripps 1950
054	17°49'N	174°17'W	1,670	Scripps MP-33C	Dredge	Scripps 1950
054	17°49'N	174°17'W	1,824/ 1,786	Scripps Stx-5D	Dredge	Scripps 1968
054	17°48'N	174°22'W	1,810/ 2,290	Scripps MP-33K	Dredge	Mero 1965
054	10°51'N	175°03'W	4,605	Lamont RC13-25	Corer (piston)	Lamont

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
054	13°51'N	175°14'W	4,217	Lamont RC13-26	Corer (piston)	Lamont
054	13°53'N	175°18'W	4,488	Lamont RC13-28	Corer (piston)	Lamont
054	12°01'N	175°37'W	5,280	Lamont V24-77	Corer (piston)	Lamont
054	12°31'N	175°51'W	5,464	Scripps Proa-162G	Corer	Scripps 1962
054	17°10'N	177°10'W	2,016	Scripps MP-37C	Dredge	Scripps 1950
054	17°04'N	177°15'W	2,010/	Scripps MP-37A	Dredge	Scripps 1950
055	16°08'N	179°44'E	5,330	Lamont V24-100	Corer (piston)	Lamont
055	13°55'N	178°20'E	5,506	Lamont RC13-30	Corer (piston)	Lamont
055	12°25'N	176°56'E	5,570	Scripps LSDH-86G	Corer (gravity)	Scripps 1962-63
055	13°38'N	175°25'E	1,400	Scripps LSDH-85G	Corer (gravity)	Scripps 1962-63
056	11°27'N	165°51'E	4,487	Scripps MP-44L	Dredge	Scripps 1950
056	11°32'N	165°39'E	2,918	Scripps MP-44J	Dredge	Scripps 1950
056	11°47'N	165°11'E	1,570/ 2,100	Scripps MP-43E	Dredge	Scripps 1950
056	11°46'N	165°10'E	1,330	Scripps MP-43LL	Dredge	Menard 1964
056	12°03'N	165°00'E	1,500/ 2,080	Scripps MP-43B	Dredge	Scripps 1950
056	11°57'N	164°59'E	1,500/ 2,100	Scripps MP-43D	Dredge	Scripps 1950
056	12°03'N	164°57'E	1,510/ 2,100	Scripps MP-43C	Dredge	Scripps 1950

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
056	12°07'N	164°52'E	3,290	Scripps MP-43J	Corer	Scripps 1950
056	11°48'N	164°50'E	1,610	Scripps MP-43DD	Dredge	Menard 1964
056	12°09'N	164°44'E	1,480/ 1,880	Scripps MP-43A	Dredge	Scripps 1950
056	15°23'N	164°16'E	5,191	Lamont V24-83	Corer (piston)	Lamont
056	19°52'N	162°58'E	4,808	Lamont V24-88	Corer (piston)	Lamont
056	19°04'N	161°23'E	4,879	Lamont V24-87	Corer (piston)	Lamont
056	19°03'N	161°19'E	3,896	Lamont V24-86	Corer (piston)	Lamont
057	19°55'N	155°59'E	5,643	USSR Vit-3631	Sounding cup	Skornyakova et al., 1962
057	17°24'N	154°38'E	4,192	U.S. Navy Nero-430	Sounding cup	Flint 1905
057	17°24'N	154°33'E	3,650	U.S. Navy Nero-427	Sounding cup	Flint 1905
057	14°48'N	154°03'E	5,460	Lamont RC10-153	Corer (piston)	Lamont
057	16°35'N	153°16'E	5,840	U.S. Navy Nero-498	Sounding cup	Flint 1905
057	17°31'N	153°07'E	3,510	U.S. Navy Nero-463	Sounding cup	Flint 1905
057	18°05'N	152°57'E	5,218	Lamont RC12-129	Corer (piston)	Lamont
057	15°31'N	150°48'E	6,140	U.S. Navy Nero-521	Sounding cup	Flint 1905
058	14°57'N	149°17'E	5,710	U.S. Navy Nero-530	Sounding cup	Flint 1905
058	10°34'N	148°25'E	5,480	Harvard Alb-246		NODC 1971

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
058	14°25'N	147°38'E	7,700	U.S.Navy Nero-591	Sounding cup	Flint 1905
058	11°35'N	147°15'E	5,880	Harvard Alb-247		NODC 1971
058	15°30'N	146°31'E	4,640	U.S.Navy Nero-600	Sounding cup	Flint 1905
058	15°15'N	146°07'E	3,190	U.S.Navy Nero-603	Sounding cup	Flint 1905
058	14°41'N	146°06'E	4,310	U.S.Navy Nero-637	Sounding cup	Flint 1905
058	13°28'N	144°36'E	1,570	U.S.Navy Nero-990	Sounding cup	Flint 1905
058	13°26'N	144°36'E	840	U.S.Navy Nero-663	Sounding cup	Flint 1905
058	19°55'N	143°52'E	3,510	U.S.Navy Nero-1055	Sounding cup	Flint 1905
058	13°42'N	143°52'E	3,519	U.S.Navy Nero-985	Sounding cup	Flint 1905
058	13°27'N	143°42'E	3,202	U.S.Navy Nero-984	Sounding cup	Flint 1905
058	13°44'N	143°32'E	3,442	U.S.Navy Nero-983	Sounding cup	Flint 1905
058	13°25'N	143°19'E	3,208	U.S.Navy Nero-982	Sounding cup	Flint 1905
058	13°31'N	142°30'E	2,640	U.S.Navy Nero-688	Sounding cup	Flint 1905
058	17°00'N	141°43'E	4,620	USSR Vit-3899	Trawl	Skornyakova et al., 1962
058	13°54'N	140°34'E	4,960	U.S.Navy Nero-705	Sounding cup	Flint 1905
059	14°08'N	139°18'E	4,830	U.S.Navy Nero-715	Sounding cup	Flint 1905
059	12°32'N	138°24'E	4,022	Alpine G.A. RA12-133	Corer (piston)	Alpine Geophys. Assoc., 1969
059	14°31'N	138°07'E	4,675	U.S.Navy Nero-951	Sounding cup	Flint 1905

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
059	14°32'N	136°30'E	5,010	U.S.Navy Nero-740	Sounding cup	Flint 1905
059	19°40'N	135°57'E	2,378/ 2,871	Lamont V28-D11	Dredge	Lamont
059	18°39'N	135°01'E	5,630	Lamont V24-119	Corer (piston)	Lamont
059	15°32'N	134°30'E	3,590	USSR Vit-3729		Skornyakova et al., 1962
059	17°11'N	133°16'E	5,997	Lamont V20-142	Corer (piston)	Lamont
059	14°11'N	131°04'E	5,371	Lamont V21-123	Corer (piston)	Lamont
059	14°50'N	130°42'E	5,980	U.S.Navy Nero-783	Sounding cup	Flint 1905
060	13°37'N	126°27'E	5,180	UNK-BH2	Core wire	Mero 1965
060	13°04'N	126°27'E	5,150	Cable Ship		Menard 1964
061	10°49'N	117°51'E	796	ESSA Pio-2D	Dredge (chain)	ESSA 1965
061	14°35'N	116°02'E	3,913	Lamont RC14-84	Corer (piston)	Lamont
083	22°18'N	107°48'W	3,000	Scripps Vs-B11-35	Trawl	Mero 1965
084	20°51'N	112°40'W	2,478	Scripps Tri-1D	Dredge	Scripps 1966
084	21°18'N	112°42'W	2,496	Scripps Tri-3D	Dredge	Scripps 1966
084	20°45'N	112°47'W	1,711	Scripps Tri-2D	Dredge	Scripps 1966
084	21°53'N	112°47'W	3,385	DH-10	Dredge	Mero 1965
084	21°48'N	113°03'W	3,450	DH-9	Dredge	Mero 1965
084	22°30'N	113°08'W	3,604	UNK-MS	Dredge	Mero 1965

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
084	24°24'N	113°16'W	1,950	Scripps MV65-1-38	Dredge	Cronan & Tooms, 1969
084	24°23'N	113°18'W	3,550	Scripps Mag Bay-A35	Dredge	Cronan & Tooms, 1969
084	24°58'N	113°23'W	3,315/ 3,340	USSR Vit-4265	Trawl (camera)	Skornyakova et al., 1962
084	24°34'N	113°28'W	3,510	Scripps MV65-1-41	Dredge	Cronan & Tooms, 1969
084	21°40'N	113°30'W	3,420	DH-8	Dredge	Mero 1965
084	29°03'N	113°33'W	384/ 493	Scripps VS-78	Dredge	Mero 1965
084	21°33'N	113°48'W	3,660	DH-7	Dredge	Mero 1965
084	20°00'N	113°57'W	3,778	USSR Vit-4273	Corer (camera)	Menard 1964
084	21°21'N	114°06'W	3,660	DH-6	Dredge	Mero 1965
084	21°27'N	114°07'W	3,800	DH-5	Dredge	Mero 1965
084	21°31'N	114°08'W	3,800	DH-4	Dredge	Mero 1965
084	21°40'N	114°11'W	3,800	DH-3	Dredge	Mero 1965
084	20°45'N	114°27'W	3,840	Scripps Tri-4D	Dredge (pipe)	Scripps 1966
084	20°32'N	114°58'W	3,705	Scripps Tri-5D	Dredge (pipe)	Scripps 1966
084	20°32'N	114°58'W	3,705	Scripps Tri-6D	Dredge	Scripps 1966
084	21°50'N	115°12'W	3,430	DH-2	Dredge	Mero 1965
084	21°59'N	116°03'W	3,890	Scripps Cb-B-XIV	Corer	Menard 1964
084	27°20'N	116°10'W	4,030	Scripps PAS-19121	Corer	Menard 1964

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
084	22°00'N	116°14'W	3,480		Dredge	Mero 1965
				DH-1		
084	29°31'N	117°17'W	540/ 820	Scripps SOB-13D	Dredge	Cronan & Tooms, 1969
084	20°19'N	117°29'W	4,010	Scripps Ris-5V	Corer	Cronan & Tooms, 1969
084	24°58'N	117°50'W	3,765	USSR Vit-4261	Corer (camera)	Menard 1964
084	20°32'N	118°48'W	4,072	Lamont RC12-46	Corer (piston)	Lamont
084	27°43'N	119°17'W	1,100/ 1,520	Scripps SIO-DX-1	Dredge	Menard 1964
084	21°05'N	119°22'W	2,607/ 2,984	Scripps Tri-9D	Dredge (chain)	Scripps 1966
084	23°30'N	119°35'W	440		Dredge	Menard 1964
				Hend-1		
084	25°15'N	119°40'W		USN Electron. Lab. NEL-Hend	Dredge	Goldberg 1954
085	29°57'N	120°42'W	4,078/ 4,017	USSR Vit-4217	Trawl	Skornyakova et al., 1962
085	23°43'N	124°06'W	3,787	Scripps Stx-2FF	Grab	Scripps 1968
085	24°22'N	125°00'W	4,330	Scripps DWHH-4	Corer	Mero 1965
085	28°59'N	125°40'W	4,000		Corer	Mero 1965
				Wig.-6		
085	29°58'N	125°55'W	4,325	USSR Vit-4221		Mero 1965
085	24°18'N	126°30'W	4,414	Scripps Msn-157G	Corer (gravity)	Mero 1965
085	21°27'N	126°43'W	4,300	Scripps DWBD-1	Dredge	Scripps 1958
085	28°23'N	126°57'W	4,340	Harvard Alb-2	Trawl	Murray 1909
085	20°51'N	127°16'W	4,702	Scripps MP-3	Corer	Mero 1965

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
086	20°00'N	130°01'W	4,895	USSR Vit-4289	Dredge	Skornyakova et al., 1962
086	20°04'N	130°04'W	4,959	Scripps Stx-3FF	Grab	Scripps 1968
086	24°55'N	132°18'W	4,975	USSR Vit-4249	Trawl	Menard 1964
086	27°53'N	132°37'W	3,700	Scripps Ris-121V	Corer (heat probe)	Scripps 1962
086	20°26'N	133°28'W	5,150	Harvard Alb-6		Menard 1964
086	25°00'N	137°19'W	4,645	USSR Vit-4245	Scoop	Mero 1965
086	23°17'N	138°15'W	4,890	Scripps Naga-8C	Dredge	Mero 1965
086	24°56'N	139°51'W	4,368	USSR Vit-4243	Scoop	Mero 1965
086	29°10'N	139°55'W	4,890	Lamont RC11-D15	Dredge (pebble)	Lamont
086	26°24'N	139°59'W	4,409	Lamont RC11-D16	Dredge (pebble)	Lamont
087	21°30'N	140°00'W	5,378	Lamont RC11-D17	Dredge (pebble)	Lamont
087	21°26'N	140°23'W	5,200	Scripps LSDH-100G	Corer (gravity)	Scripps 1962-63
087	23°17'N	141°13'W	5,540	Scripps Naga-10B	Corer	Menard 1964
087	23°17'N	141°13'W	5,540	Scripps Naga-10C	Corer	Mero 1965
087	22°57'N	143°58'W	4,750	Scripps Hilo-4G	Corer (gravity)	Scripps 1962
087	22°57'N	143°58'W	4,850	Scripps Hilo-5G	Corer (gravity)	Scripps 1962
087	24°50'N	144°05'W	5,190	USSR Vit-4239	Trawl (camera)	Skornyakova et al., 1964
087	23°50'N	144°46'W	5,280	Scripps Naga-13A	Dredge	Menard 1964

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
087	26°42'N	147°29'W	5,365	Scripps Zs-VII-38G	Corer (gravity)	Scripps 1966
087	23°54'N	148°00'W	5,220	Scripps Naga-15	Dredge	Mero 1965
088	22°00'N	150°00'W	5,240	Scripps Naga-16	Corer	Mero 1965
088	23°12'N	154°27'W	1,556	Lamont RC12-76	Corer (piston)	Lamont
088	22°39'N	154°45'W	4,441	Scripps Sh-A-27GA	Corer	Scripps 1966
088	21°59'N	154°59'W	4,384	Scripps Sh-H-21G	Corer	Scripps 1966
088	26°11'N	155°12'W	5,080	Challenger Chal-258	Bottle	Menard 1964
088	27°15'N	157°00'W	5,720	Lamont V21-D6	Trawl (biology)	Lamont
088	29°15'N	157°02'W	5,830	Lamont V21-D5	Trawl (biology)	Lamont
088	22°42'N	157°02'W	4,526	Scripps Sh-H-7G	Corer	Scripps 1966
088	24°16'N	157°56'W	3,968	Lamont RC12-188	Corer (piston)	Lamont
088	21°10'N	157°57'W	590	U.S.Navy Nero-2067	Cup	Flint 1905
088	21°53'N	158°07'W	2,712	U.S.Navy Nero-2048	Cup	Flint 1905
088	28°20'N	158°20'W	5,360	Lamont RC12-187	Corer (piston)	Lamont
088	21°45'N	158°39'W	989	U.S.Navy Nero-2056	Cup	Flint 1905
088	28°24'N	159°11'W	5,680	Lamont V21-D4	Trawl (biology)	Lamont
088	23°01'N	159°21'W	4,856	Lamont V21-D8	Trawl (biology)	Lamont
089	29°44'N	161°10'W	5,760	Lamont RC13-12	Corer (piston)	Lamont

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
089	27°36'N	161°54'W	4,947	Lamont RC13-15	Corer (piston)	Lamont
089	25°41'N	167°18'W	2,680	U.S. Navy Nero-93	Cup	Flint 1905
089	26°23'N	168°35'W	3,700	U.S. Navy Nero-106	Cup	Flint 1905
090	20°00'N	171°00'W	3,750	Scripps MP27-1	Corer	Menard 1964
090	20°00'N	171°00'W	2,140/ 2,210	Scripps MP-28	Dredge	Scripps 1950
090	20°03'N	171°38'W	3,477	USSR Vit-4331	Spoon	Skornyakova et al., 1962
090	29°37'N	174°07'W	5,156	Scripps Zs-V-13G	Corer	Scripps 1966
090	24°00'N	175°40'W	5,318	USSR Vit-4347	Scoop	Skornyakova et al., 1968
090	28°41'N	176°43'W	2,914	U.S. Navy Nero-167	Cup	Flint 1905
090	28°41'N	176°45'W	2,266	U.S. Navy Nero-175	Cup	Flint 1905
090	28°54'N	176°48'W	4,419	U.S. Navy Nero-179	Cup	Flint 1905
090	28°53'N	177°52'W	1,567/ 1,825	Scripps Stx-25D	Dredge	Scripps 1968
090	29°05'N	178°03'W	1,611/ 1,675	Scripps Stx-24D	Dredge	Scripps 1968
091	24°00'N	179°58'E	5,815	USSR Vit-4343	Scoop	Mero 1965
091	25°48'N	176°13'E	5,782	Lamont V24-93	Corer (piston)	Lamont
091	25°45'N	175°53'E	5,894	Scripps Nv-A-5G	Corer (gravity)	Scripps 1967
091	25°47'N	175°32'E	5,850	U.S. Navy Nero-257	Cup	Flint 1905

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
091	27°42'N	175°10'E	5,750	Scripps Jyn-IV-11G	Corer (gravity)	Scripps 1961
091	23°55'N	173°40'E		USSR Vit-3782		Nikolayev & Yefimova, 1963
091	24°32'N	171°33'E	5,650	U.S. Navy Nero-285	Cup	Flint 1905
091	23°57'N	170°58'E	5,817	USSR Vit-4351	Spoon	Skornyakova et al., 1962
092	24°02'N	167°24'E	6,052	USSR Vit-4355	Scoop	Mero 1965
092	21°26'N	163°19'E	3,900	U.S. Navy Nero-338	Cup	Flint 1905
092	21°25'N	163°17'E	3,369	U.S. Navy Nero-339	Cup	Flint 1905
092	21°24'N	163°15'E	2,646	U.S. Navy Nero-340	Cup	Flint 1905
092	24°01'N	163°02'E	5,542	USSR Vit-4359	Spoon	Skornyakova et al., 1962
092	21°15'N	162°48'E	4,100	U.S. Navy Nero-350	Cup	Flint 1905
092	21°21'N	162°42'E	3,437	U.S. Navy Nero-1704	Cup	Flint 1905
092	20°38'N	161°11'E	4,160	U.S. Navy Nero-361	Cup	Flint 1905
092	20°38'N	160°58'E	3,930	U.S. Navy Nero-373	Cup	Flint 1905
092	24°04'N	160°46'E	3,951	USSR Vit-4362	Spoon	Skornyakova et al., 1962
093	26°12'N	153°44'E	6,120	USSR Vit-4370	Trawl	Skornyakova et al., 1962
094	28°23'N	148°15'E	2,423	Scripps Zs-IV-5D	Dredge	Scripps 1966
094	21°27'N	143°35'E	3,095	U.S. Navy Nero-1406	Cup	Flint 1905

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
094	25°14'N	143° 05'E	3,080	U. S. Navy Nero-1151	Cup	Flint 1905
094	25°46'N	143°01'E	3,658	U. S. Navy Nero-1340	Cup	Flint 1905
094	27°05'N	142°57'E	4,905	U. S. Navy Nero-1142	Cup	Flint 1905
094	23°12'N	141° 47'E	1,252	Lamont V21-94	Corer (piston)	Lamont
095	28°23'N	136° 17'E	4,518	Scripps Zs-IV-12G	Corer	Scripps 1966
120	32°17'N	117° 32'W	710	Scripps SIO-DX-2	Dredge	Menard 1964
120	30°12'N	117° 38'W	1,300	Scripps SOB-10D	Dredge	Krause 1964
120	31°19'N	117° 38'W	2,100/ 2,120	Scripps SOB-5D	Trawl (Otter)	Krause 1964
120	30°18'N	117° 40'W	1,060	Scripps SOB-27D	Dredge	Krause 1964
120	32°50'N	118° 00'W	2,000	S Clem	Dredge	Goldberg & Arrhenius, 1958
120	31°23'N	118° 03'W	1,040	Scripps SOB-20D	Dredge	Krause 1964
120	32°45'N	118° 13'W	1,588	S Clem-SV	Dredge	Mero 1965
120	31°05'N	118° 37'W	1,650/ 1,830	Scripps SOB-25D	Dredge	Krause 1964
120	31°21'N	119° 03'W	695	Scripps SOB-22D	Dredge	Krause 1964
121	30°25'N	122° 45'W	450	USN Electron Lab. NEL-292	Dredge	Menard 1964
121	32°24'N	127° 47'W	499/ 512	USN Electron Lab. NEL-662	Dredge	Menard 1964
121	33°21'N	128° 45'W	4,318	Lamont RC10-233	Corer (piston)	Lamont
122	32°51'N	132° 32'W	710	U. S. Navy NEL-667	Dredge	Carsola & Dietz, 1952

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
122	39°38'N	135°06'W	4,790	Lamont V20-72	Corer (piston)	Lamont
122	35°06'N	137°56'W	5,035	USSR Vit-4199	Dredge	Skornyakova et al., 1964
122	34°59'N	139°57'W	5,303	Lamont RC11-194	Corer (piston)	Lamont
122	31°51'N	139°58'W	4,934	Lamont RC11-195	Corer (piston)	Lamont
122	31°51'N	139°58'W	4,991	Lamont RC11-D14	Dredge (pebble)	Lamont
123	39°56'N	140°02'W	4,748	Lamont RC11-193	Corer (piston)	Lamont
123	39°56'N	140°02'W	4,748	Lamont RC11-D13	Dredge (pebble)	Lamont
123	34°04'N	145°56'W	5,390	Scripps UPWD-1	Dredge	Mero 1965
123	34°08'N	145°57'W	5,300	Scripps UPWD-2	Dredge	Mero 1965
124	35°13'N	154°43'W	5,540	Challenger Chal-254	Bottle	Murray 1885
124	30°22'N	154°56'W	5,400	Challenger Chal-256	Dredge	Murray 1885
124	38°09'N	156°25'W	5,720	Challenger Chal-253	Dredge	Murray 1885
124	31°31'N	159°42'W	5,720	Lamont V21-D3	Trawl (biology)	Lamont
125	37°52'N	160°17'W	5,020	Challenger Chal-252	Trawl	Murray 1885
125	34°54'N	160°19'W	5,577	Lamont V21-D2	Trawl (biology)	Lamont
125	35°02'N	166°28'W	5,902/ 5,913	USSR Vit-4090	Trawl	Skornyakova et al., 1962
126	35°00'N	172°57'W	5,971	USSR Vit-4084	Spoon	Skornyakova et al., 1962

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
126	37°18'N	178°10'W	5,449	Lamont V20-104	Corer (piston)	Lamont
127	37°41'N	177°04'E	5,300	Challenger Chal-248	Trawl	Murray 1885
127	39°38'N	173°43'E	4,312	Lamont RC10-179	Corer (piston)	Lamont
128	37°03'N	166°34'E	4,978	Lamont RC11-D5	Camera frame	Lamont
128	35°20'N	162°38'E	5,158	Lamont RC11-164	Corer (piston)	Lamont
128	37°16'N	162°24'E	1,295/ 1,110	Scripps Zs-III-2D	Dredge	Scripps 1966
128	34°47'N	160°40'E	4,226	Lamont RC10-176	Corer (piston)	Lamont
129	31°50'N	157°20'E	3,638	Lamont RC10-165	Corer (piston)	Lamont
130	36°29'N	146°43'E	5,720	Scripps JynII-21	Corer (gravity)	Scripps 1961
130	38°00'N	146°00'E	3,500	Univ. Tokyo JEDS-5	Trawl	Mero 1965
130	47°40'N	145°26'E	5,396	Scripps Car-57	Snapper	Menard 1964
130	30°59'N	141°09'E	2,730	U.S.Navy Nero-1185	Cup	Flint 1905
130	32°10'N	140°56'E	3,110	U.S.Navy Nero-1197	Cup	Flint 1905
131	34°23'N	139°05'E	260	Scripps Jap-B	Dredge	Mero 1965
131	34°33'N	139°05'E	260	Scripps Jap-A-1	Dredge	Menard 1964
131	33°51'N	138°41'E	110	Scripps Jap-A	Dredge	Mero 1965
131	35°15'N	138°41'E	114	Scripps Jap-B-2	Dredge	Menard 1964

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
157	40°23'N	127°21'W	1,700	CasD-8	Dredge	Menard 1964
157	40°22'N	127°33'W	1,450	Scripps Fan-S16	Corer	NODC 1971
157	40°23'N	127°59'W	1,260	Scripps Fan-BD-25	Dredge	NODC 1971
157	42°45'N	128°03'W	2,520	CasD-5	Dredge	Menard 1964
157	41°10'N	128°16'W	2,600	Scripps Fan-B24	Corer	NODC 1971
157	40°16'N	128°28'W	4,060/ 4,400	Scripps Fan-BD-20	Dredge	Scripps 1959
158	40°20'N	135°47'W	4,471/ 4,477	USSR Vit-4191	Corer & Trawl	Skornyakova et al., 1962
158	42°02'N	139°57'W	4,116	Lamont RC11-D12	Dredge (pebble)	Lamont
158	42°02'N	139°57'W	4,116	Lamont RC11-192	Corer (piston)	Lamont
159	43°58'N	140°38'W	4,350	Scripps Cusp-8P	Corer	Scripps 1952-53
160	40°11'N	151°39'W	5,081	Lamont V20-88	Corer (piston)	Lamont
160	40°14'N	155°55'W	4,938			Willis & Ahrens, 1962
160	40°14'N	155°55'W	5,029	Scripps NH-C10	Corer (wire)	Scripps 1951
160	41°08'N	159°54'W	5,435/ 5,456	USSR Vit-4104	Trawl	Skornyakova et al., 1962
162	40°24'N	175°42'W	6,065	USSR Vit-4074	Trawl	Skornyakova et al., 1962
162	44°45'N	173°02'W	4,835	Scripps Ck-13	Corer (gravity)	Menard 1964
163	40°30'N	170°48'E	5,460	Scripps JynII-9G	Corer	Scripps 1961
163	44°28'N	170°15'E	1,258	USSR Vit-3150	Trawl	Skornyakova et al., 1962

Marsden Square	Location Lat.	Long.	Depth in meters	Institution and number	Method of sampling	Reference or source
195	56°20'N	142°30'W	900	Scripps NH-D-5	Dredge (chain bag)	NODC 1971
195	53°32'N	144°17'W	1,000	Scripps NH-D-2	Dredge (chain bag)	NODC 1971
195	53°32'N	144°17'W	1,100/ 1,550	Scripps NH-D-3	Dredge (chain bag)	NODC 1971
195	56°10'N	145°15'W	1,370/ 1,800	Scripps NH-D-7	Dredge (chain bag)	NODC 1971
196	52°47'N	150°05'W	1,500	Scripps NH-D-1	Dredge (chain bag)	NODC 1971

TABLE 2

CHEMICAL ANALYSES

OF FERROMANGANESE NODULES AND CRUSTS

NORTH PACIFIC

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
1	012	06°38'N 110°56'W	4,316	Lamont RC10-76	Corer (piston)	Nodule	Lamont (unpublished)		Atomic absorption	0.74	0.45	0.08		21.5			
2	012	01°27'N 116°13'W	4,000	Scripps DWBG-147B	Corer (gravity)	Nodule 1x1.5x1.5 cm	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.76	0.47	0.05	12.6	18.8	3.5	1.8	1.5
						Nodule 1x1.5x1.5 cm	Scripps-NODC (unpublished)		Emission spectrography	1.1	0.68	0.07	18.2	27.2	5.1	2.6	1.5
3	012	05°20'N 117°55'W	4,330	Scripps Ris 14V	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.48	0.91	0.05	7.15	30.28			4.2
4	012	09°59'N 118°00'W	4,295	Scripps DWHH-92	Corer (gravity)	Nod. frag. 1.5x1.5x2 cm	Scripps-NODC (unpublished)		Emission spectrography	1.0	0.74	0.09	11.2	24.6	9.8	1.5	2.2
5	013	08°30'N 120°08'W	3,389	Lamont V20-31	Corer (piston)	Nodule	Lamont (unpublished)		Atomic absorption	0.74	0.10	0.25		20.0			
6	013	06°46'N 122°57'W	4,508	Lamont V21-199	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	1.26	1.08	0.08	4.8	26.4			5.5
7	013	07°18'N 125°20'W	4,610?	Lamont RC10-93	Corer (piston)	Nodule	Lamont (unpublished)		Atomic absorption	1.33	1.27	0.14		30.0			
8	013	08°09'N 125°20'W	4,360	Scripps Cb-39	Corer	Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.16	1.36	0.18	6.3	28.1	5.8	1.5	4.5
9	013	08°05'N 125°25'W	4,453	Scripps Cb-17	Corer	Nodule 1.0 cm diam	Scripps-NODC (unpublished)	Whole nodule	X-ray fluorescence spectrography	1.19	1.59	0.17	6.7	26.2	6.1	1.2	3.9
10	013	07°41'N 125°37'W	4,416	Scripps Cb-19	Corer	Nodule 0.6 cm diam	Mero, 1965	Half nodule	X-ray fluorescence spectrography	0.40	0.55	0.09	9.2	9.3	14.3	0.7	1.0
11	013	08°01'N 126°58'W	4,440	Scripps Cb-34	Corer (gravity)	Nodule	Scripps-NODC (unpublished)		Emission spectrography	1.8	1.6	0.18	5.3	34.1	7.5	1.4	6.4
12	014	08°48'N 130°48'W	4,917	Scripps DWBG-7	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.52	1.23	0.12	4.36	24.56			5.6
13	014	09°50'N 136°23'W	4,823	Lamont RC12-58	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	1.20	0.94	0.27	5.8	21.8			3.8
14	014	08°59'N 137°41'W	4,660	Lamont RC12-59	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.11	0.11	0.05	8.20	2.50			0.3
15	014	09°57'N 137°47'W	4,930	Harvard Alb-13	Trawl (Blake)	Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.36	1.20	0.20	4.8	29.8		1.5	6.2
						Nodule	Scripps-NODC (unpublished)		Emission spectrography	2.0	1.4	0.18	5.3	32.	7.5	1.8	6.0
						Nodule	Ahrens et al., 1967	2 pieces	Emission spectrography	1.70	1.21	0.25	4.43	38.1		1.7	8.7
						Nodule 2x3x3 cm	Hewett et al., 1963		Spectrography	1.5	1.5	0.3	7.0	>10.	7.0	3.	

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
16	014	09°57'N 137°47'W	4,930	2P-52	Dredge		Cronan and Tooms, 1969		Emission spectrography	1.93	1.59	0.14	5.41	23.46			4.3
17	014	08°47'N 139°53'W	5,086	Lamont RC11-206	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.94	0.98	0.26	6.7	16.8			3.0
18	014	08°47'N 139°53'W	5,086	Lamont RC11-D21	Dredge (pebble)	Nodule	Lamont (unpublished)		Wet chemical	1.28	1.32	0.20	11.6	6.00		1.4	0.5
19	015	09°06'N 145°18'W	5,400	Scripps Msn-148G	Corer (gravity)	Nodule 1.5x2.5x2.7 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.52	1.27	0.26	5.3	26.2	6.3	1.4	4.9
20	015	09°13'N 149°49'W	5,073	Lamont RC12-69	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.90	0.66	0.28	10.1	17.0			1.7
21	015	08°02'N 149°54'W	5,073	Scripps Jyn V-15PG	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.21	0.98	0.26	9.34	23.63			2.5
22	016	09°27'N 150°42'W	5,100	Scripps Jyn V-13G	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.41	0.45	0.12	10.50	5.41			0.5
23	016	08°59'N 152°50'W	4,839	Scripps Wah-4PG	Corer		Cronan and Tooms, 1969		Emission spectrography	1.33	0.78	0.41	10.94	22.61			2.1
24	016	08°16'N 153°01'W	5,143	Scripps Wah-24FF-8	Corer		Cronan and Tooms, 1969		Emission spectrography	1.86	1.65	0.25	7.31	24.89			3.4
25	016	07°55'N 153°42'W		U.S.S.R. Vit-5124		Nodule	Skornyakova et al., 1968		Wet chemical and colorimetry	0.53	1.59	0.12	5.77	25.49			4.4
26	017	09°57'N 167°51'W	5,279	Scripps Dodo-20C	Corer (camera)	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.08	1.09	0.27	9.43	22.75			2.5
27	017	07°47'N 168°00'W	4,994	Scripps Msn-J	Corer	Nodule 2x2.5x2.5 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.60	0.43	0.39	13.8	20.2	4.4	1.7	1.5
28	017	09°41'N 168°42'W	5,222	Lamont RC12-195	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.52	0.37	0.17	6.60	11.2			1.7
29	017	09°20'N 168°50'W	5,240	Scripps Dodo-25PG	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.11	0.98	0.35	9.51	20.41			2.2
30	017	08°34'N 168°52'W	4,397	Scripps Proa-151G	Corer		Cronan and Tooms, 1969		Emission spectrography	0.55	0.45	0.44	12.04	18.38			1.5
31	018	06°03'N 170°00'W	5,400	Scripps Msn-K	Corer	Nodule 1.5x1.5 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.54	1.90	0.16	5.25	29.0	5.2	1.5	5.5
32	018	08°06'N 170°25'W	5,444	Scripps Proa-139G	Corer (gravity	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.07	1.22	0.19	8.96	20.71			2.3
33	018	08°33'N 170°59'W	5,169	Lamont RC13-19	Corer (piston)	Nodule	Lamont (unpublished)		Atomic absorption	1.07	0.98	0.27	10.6	25.2			2.4

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
34	018	09°49'N 170°59'W	4,875	Scripps LSDH-93PG	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.67	0.43	0.29	13.03	20.94			1.6
35	018	07°04'N 171°42'W	5,386	Scripps Proa-137G	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.47	0.21	0.51	16.67	18.62			1.1
36	018	07°19'N 175°28'W	5,190	Scripps LSDH-90PG	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.69	0.35	0.46	14.78	17.80			1.2
37	018	09°46'N 175°37'W	5,760	Lamont RC12-197	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.90	0.90	0.26	8.80	18.4			1.2
38	018	08°08'N 177°10'W	5,435	Scripps LSDH-89PG	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.54	0.33	0.21	12.81	15.78			1.2
39	018	09°42'N 177°59'W	5,953	Lamont RC12-198	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	1.06	1.80	0.21	7.40	20.3			2.7
40	018	06°02'N 178°35'W	5,097	Scripps Proa-101PG	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.25	0.18	0.38	15.48	15.84			1.0
41	018	00°15'N 179°43'W	5,045	Scripps Proa-105G	Corer		Cronan and Tooms, 1969		Emission spectrography	0.65	0.54	0.15	15.85	17.14			1.1
42	019	09°17'N 178°57'E	5,821/ 5,996	Lamont V24-D1	Dredge	Nodule	Lamont (unpublished)		Wet chemical	0.40	0.35	0.29	13.9	16.0			1.2
43	019	08°19'N 176°25'E	5,097	Lamont V24-102	Corer (piston)	Crust	Lamont (unpublished)		Wet chemical	1.04	0.60	0.37	10.8	17.2			1.6
44	019	01°28'N 174°52'E	4,691	Lamont RC12-200	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.42	0.52	0.21	15.6	14.6			0.9
45	047	11°38'N 103°48'W	3,500	Scripps Acap-10	Corer	Nodule 0.1 cm diam	Mero, 1965		X-ray fluorescence spectrography	0.04	0.08	0.01	6.3	1.7	12.1	12.6	0.3
46	047	10°53'N 105°07'W	3,275	Scripps Acap-11	Corer	Nodule 1 cm diam	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.04	0.08	0.03	15.5	3.4	13.3	3.0	0.2
47	048	11°25'N 113°48'W	4,085	Swed. Deep Sea SDSE-48	Corer	Nodule 1 cm diam	Mero, 1965		X-ray fluorescence spectrography	1.01	0.66	0.21	11.5	23.2	4.2	1.8	2.0
48	048	19°20'N 114°12'W	3,480	Trans-14D	Corer	Nodule 3x3x1 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.09	0.71	0.23	10.2	22.6	6.1	1.4	2.2
49	048	19°46'N 114°44'W	3,438	Trans-14C	Corer	Nodule 1x3x2 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.93	0.61	0.22	12.0	21.2	5.9	1.5	1.8
50	048	14°26'N 117°12'W	4,125	Scripps Ris-8V	Corer (heat probe)	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.89	1.06	0.08	10.30	26.84			2.6
51	048	19°52'N 119°53'W	4,226	Lamont RC12-47	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	1.30	0.76	0.36	9.50	22.7			2.4

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
52	049	12°16'N 120°10'W	4,471	Lamont RC10-91	Corer (piston)	Crust	Lamont (unpublished)		Atomic absorption	1.68	1.4	0.16	5.08	31.5		1.3	6.2
53	049	19°49'N 121°44'W	4,138	UNK-RR	Dredge	Nodule	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.09	0.76	0.36	9.6	21.4	7.9	1.3	2.2
54	049	19°00'N 121°53'W	4,138	Scripps Cb-1	Corer (gravity)	Nodule 0.1 cm diam	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.16	0.87	0.40	9.5	22.4	6.8	1.3	2.4
55	049	14°55'N 124°12'W	4,270	Scripps Cap-50B	Corer		Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.15	1.25	0.39	7.6	22.4	7.6	1.2	3.0
56	049	16°03'N 125°01'W	4,354	Scripps Cb-2	Corer (gravity)	Nodule	Mero, 1965		X-ray fluorescence spectrography	1.22	1.05	0.27	7.3	23.8	7.4	1.4	3.3
57	049	15°04'N 125°05'W	4,500	Scripps Amp-3PG	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.91	1.24	0.23	5.95	23.19			4.0
58	049	15°00'N 125°26'W	4,380	Scripps Cb-3	Corer	Nodule 1 cm diam	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.00	0.82	0.38	9.7	22.2	5.9	1.4	1.9
							Scripps-NODC (unpublished)		X-ray fluorescence spectrography	1.23	0.95	0.34	8.3	24.0	5.4	1.5	2.9
59	049	10°19'N 125°27'W	4,545	Scripps Cb-9	Corer	Nodule 0.5 cm diam	Scripps-NODC (unpublished)		X-ray fluorescence spectrography	1.06	1.06	0.36	10.0	18.9	8.1	1.8	1.9
60	049	13°03'N 125°29'W	4,440	Scripps Cb-5	Corer (gravity)		Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.06	1.06	0.32	6.3	22.2	9.7	1.2	3.5
							Scripps-NODC (unpublished)		Emission spectrography	0.9	1.0	0.10	2.4	27.8	11.2	0.9	11.6
61	049	16°35'N 125°35'W	4,369	Lamont RC12-50	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	1.16	0.72	0.30	8.60	22.0			2.6
62	049	10°37'N 128°54'W	4,636	Lamont V20-D1	Dredge (rock)	Nodule	Lamont (unpublished)		Wet chemical	1.28	1.10	0.22	3.9	29.6		1.4	7.6
63	050	10°26'N 130°38'W	4,890	Scripps DWBD-2	Dredge	Nodule 4x3x1 cm	Mero, 1965	Half nodule	X-ray fluorescence spectrography	1.25	1.21	0.26	7.6	22.7	7.3	1.5	3.0
						Nodule 2.4 cm diam	Scripps-NODC (unpublished)		Emission spectrography	1.7	1.4	0.17	5.9	31.6	7.5	1.8	5.4
64	050	18°16'N 131°46'W	5,210	Scripps Jyn V-50PG	Corer		Cronan and Tooms, 1969		Emission spectrography	1.09	0.74	0.22	9.58	24.26			2.5
65	050	11°24'N 132°07'W	4,843	Lamont V20-36	Corer	Nodule	Lamont (unpublished)		Wet chemical	1.34	1.32	0.24	0.50	28.5		0.7	57.0
66	050	14°22'N 133°07'W	4,816	Scripps MP-5	Corer	Nodule	Mero, 1965	Outer 1 cm	X-ray fluorescence spectrography	1.05	0.78	0.45	9.2	22.9	7.0	1.4	2.5

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
67	050	15°54'N 133°57'W	4,606	Scripps Jyn V-48PG	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.66	0.20	0.32	13.57	20.52			1.5
68	050	16°15'N 137°06'W	4,553	Scripps Car-78	Snapper	Nodule 1 cm diam	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.46	0.40	0.20	8.9	10.0	13.7	0.8	1.1
69	050	13°07'N 138°56'W	4,927	Scripps Msn-153PG	Corer	Nodule 1x1.2x1 cm	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.50	1.31	0.33	5.1	25.0	6.3	1.4	5.0
70	050	10°45'N 139°24'W	4,770	Lamont V21-D13	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	1.36	0.68	0.30	7.4	20.8		1.5	2.8
71	050	11°01'N 139°58'W	4,877	Lamont RC11-D20	Dredge (pebble)	Nodule	Lamont (unpublished)		Wet chemical	1.62	1.10	0.32	6.0	30.5		1.4	5.1
72	051	19°29'N 140°02'W	5,574	Lamont RC11-D18	Dredge (pebble)	Nodule	Lamont (unpublished)		Wet chemical	0.64	0.36	0.16	9.0	13.6		0.8	1.5
73	051	14°52'N 140°02'W	4,828	Lamont RC11-D19	Dredge (pebble)	Nodule	Lamont (unpublished)		Wet chemical	1.10	0.70	0.18	8.5	21.0		1.3	2.5
74	051	10°59'N 142°37'W	4,978	Scripps Msn-150G	Corer (gravity)	Nodule	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.23	0.96	0.31	6.4	17.0	9.9	1.2	2.7
75	051	15°03'N 142°46'W	4,526	Lamont V20-44	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.38	0.20	0.27	16.4	20.6		2.2	1.3
76	051	11°55'N 144°54'W	5,539	Scripps Jyn V-31PG	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.52	0.37	0.18	10.61	19.45			1.8
77	051	12°19'N 145°08'W	5,550	Lamont V21-D11	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	1.28	1.36	0.27	5.4	25.6		1.5	4.7
78	051	14°26'N 145°21'W	4,640	Lamont V20-48	Corer	Nodule	Lamont (unpublished)		Wet chemical	1.18	1.08	0.27	5.6	24.0		1.5	4.3
79	051	14°25'N 145°52'W	4,618	Lamont V20-D4	Dredge (rock)	Nodule	Lamont (unpublished)		Wet chemical	0.52	0.39	0.26	9.60	13.4			1.4
80	051	13°10'N 147°45'W	5,603	Lamont V21-D10	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	1.12	0.40	0.32	9.5	16.4		1.8	1.7
81	052	13°44'N 150°00'W	5,218	Lamont V21-D9	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	0.69	0.75	0.18	4.25	17.5			4.1
82	052	14°19'N 152°37'W	5,480	Challenger Chal-264	Trawl	Nodule	Murray and Renard, 1891	Whole nodule	Wet chemical	-1.	-1.5	-0.5	16.15	18.4	13.2	1.5	1.1
83	052	11°51'N 152°56'W	5,221	Scripps Wah-2PG	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.72	0.46	0.26	11.98	15.44			1.3
84	052	11°17'N 154°08'W		U.S.S.R. Vit-5126		Nodule	Skornyakova et al., 1968		Wet chemical and colorimetry	0.64	0.35	0.26	9.32	20.19			2.2

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
85	052	10°22'N 157°08'W	5,343	Lamont RC13-58	Corer (piston)	Nodule	Lamont (unpublished)		Atomic absorption	0.74	0.45	0.27	12.4	19.6			1.6
86	053	14°11'N 161°08'W	5,652	Scripps Msn-G	Corer	Nodule	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.98	0.81	0.31	9.2	23.3	5.6	1.5	2.5
87	053	13°05'N 163°10'W	5,413	Scripps Tet-27A	Corer	Nodule	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.86	0.65	0.31	10.0	18.5	8.8	1.6	1.9
88	053	13°50'N 163°32'W	5,460	Lamont RC12-79	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.84	0.58	0.26	10.2	21.2			2.0
89	053	11°01'N 164°56'W	4,835	Scripps Proa-148G	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.60	0.65	0.44	17.08	19.23			1.1
90	053	10°30'N 165°33'W	4,341	Scripps Proa-147V	Corer (heat probe)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.66	0.32	0.88	16.38	14.18			0.9
91	053	16°06'N 165°45'W	2,400	Scripps Tet-22	Corer	Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.25	0.04	0.73	17.2	16.0	6.0	2.0	0.9
92	053	16°05'N 165°52'W	5,295	Lamont RC12-193	Corer (piston)	Nodule	Lamont (unpublished)		Atomic absorption	0.64	0.45	0.29	11.0	16.8			1.5
93	053	15°36'N 166°40'W	5,440	Scripps Proa-169G	Corer	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.34	0.16	0.84	16.95	16.70			1.0
94	053	19°07'N 169°44'W	1,740	Scripps MP-25F1	Dredge (chain bag)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.44	0.07	1.28	12.72	13.38			1.0
95	053	19°07'N 169°44'W	1,741/ 1,786	Scripps MP-25F2	Dredge (chain bag)	Nodule 3x2x2 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.42	0.10	0.95	14.5	20.5	3.3	2.1	1.4
							Hewett et al., 1963		Emission spectrography	0.7	0.15	1.5	>10.	>10.	3.	1.5	
96	054	10°23'N 170°57'W	4,469	Scripps Proa-156G	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.77	0.63	0.69	14.54	17.01			1.2
97	054	19°25'N 171°00'W	1,320/ 1,410	Scripps MP-26A-3	Dredge (chain bag)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.47	0.06	1.17	11.68	12.28			1.0
						Nodule 3x3x3 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.60	0.15	0.95	13.3	22.7	2.7	2.2	1.7
						Nodule	Goldberg, 1954		Colorimetry	0.31	0.19	0.46					
						Nodule	Dietz, 1955		Colorimetry	0.52		0.8	16.8	16.9			1.7
98	054	12°59'N 171°05'W	5,546	Lamont RC13-18	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.59	0.46	0.31	13.6	19.6			1.4

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
99	054	10°20'N 172°06'W	5,106	Scripps Proa-157G	Corer		Cronan and Tooms, 1969		Emission spectrography	0.40	0.24	0.43	13.72	20.63			1.5
100	054	11°23'N 172°47'W	5,380	Scripps Proa-159G	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.49	0.27	0.43	14.80	17.12			1.2
101	054	12°16'N 172°48'W	2,708	Scripps Proa-161G	Corer		Cronan and Tooms, 1969		Emission spectrography	0.31	<0.05	0.90	16.03	13.02			0.8
102	054	18°20'N 173°17'W	3,950	Scripps MP-32	Corer	Crust	Mero, 1965		X-ray fluorescence spectrography	0.30	0.17	0.42	14.6	13.1	7.1	1.5	0.9
103	054	17°48'N 174°22'W	1,810/ 2,290	Scripps MP-33K	Dredge		Cronan and Tooms, 1969		Emission spectrography	0.23	0.08	0.88	14.49	11.13			0.8
						Crust 1 cm	Mero, 1965		X-ray fluorescence spectrography	0.29	0.07	0.70	14.05	14.4	4.9	6.8	1.0
							Hewett et al., 1963		Emission spectrography	0.3	0.15	1.5	>10.	>10.	3.	7.	
104	054	12°01'N 175°37'W	5,280	Lamont V24-77	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.20	0.28	0.16	15.2	17.3			1.1
105	054	12°31'N 175°51'W	5,464	Scripps Proa-162G	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.53	0.43	0.72	12.88	15.85			1.2
106	054	17°10'N 177°10'W	2,016	Scripps MP-37C	Dredge	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.34	0.09	0.88	13.27	14.97			1.1
107	054	17°04'N 177°15'W	2,010 1,830	Scripps MP-37A	Dredge	Crust 2 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.47	0.19	0.45	10.7	13.0	4.1	8.5	1.2
							Goldberg, 1954		Colorimetry	0.58	0.48	0.54	13.4	21.7			1.6
							Dietz, 1955		Wet chemical	0.58		0.54	13.19	21.03			1.6
108	055	16°08'N 179°44'E	5,330	Lamont V24-100	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.28	0.35	0.16	15.8	16.8			1.1
109	056	11°57'N 164°59'E	1,500/ 2,100	Scripps MP-43D	Dredge	Crust 5 cm	Mero, 1965		Emission spectrography	0.42	0.11	1.05	11.5	19.5	1.7	1.6	1.7
111	056	12°09'N 164°44'E	1,480/ 1,880	Scripps MP-43A	Dredge		Goldberg, 1954		Colorimetry	0.61	0.47	0.61	15.6	23.6			1.5
							Cronan and Tooms, 1969		Emission spectrography	0.52	0.04	1.60	13.53	19.40			1.4

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
112	057	19°55'N 155°59'E	5,643	U.S.S.R. Vit-3631	Spoon	Nodule 4 cm diam	Skornyakova et al., 1962		Wet chemical and colorimetry	0.33		0.53	14.4	17.2	6.2	1.8	1.2
113	057	14°48'N 154°03'E	5,460	Lamont RC10-153	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.46	0.24	0.37	19.2	18.0		2.0	1.0
114	057	18°05'N 152°57'E	5,218	Lamont RC12-129	Corer (piston)	Nodule	Lamont (unpublished)		Atomic absorption	0.50	0.32	0.34	15.0	14.8			1.0
116	083	22°18'N 107°48'W	3,000	Scripps VS-B11-35	Trawl	Nodule 5x2x1 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.12	0.05	0.02	1.36	24.8	13.4	0.9	18.2
117	084	21°53'N 112°47'W	3,385	Scripps DH-10	Dredge	Nodule	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.54	0.31	0.01	5.7	30.3			5.3
118	084	21°48'N 113°03'W	3,450	Scripps DH-9	Dredge	Nodule	Mero, 1965	Half nodule	X-ray fluorescence spectrography	1.10	0.47	0.04	8.3	31.0			3.7
119	084	22°30'N 113°08'W	3,604	UNK-MS	Dredge	Nodule 5x3x3 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.63	0.42	0.26	4.85	28.8	7.9	1.3	5.9
120	084	24°24'N 113°16'W	1,950	Scripps MV 65-1-38	Dredge		Cronan and Tooms, 1969		Emission spectrography	0.11	0.09	0.01	1.99	33.92			17.0
121	084	24°23'N 113°18'W	3,550	Scripps Mag Bay-A35	Dredge		Cronan and Tooms, 1969		Emission spectrography	0.11	0.06	0.01	1.69	33.90			20.1
122	084	24°58'N 113°25'W	3,315/ 3,340	U.S.S.R. Vit-4265	Trawl (camera)	Nodule	Skornyakova et al., 1962	Outer 1 cm	Wet chemical and colorimetry	0.18		0.00	1.2	32.8	5.4	1.8	27.3
123	084	24°34'N 113°28'W	3,510	Scripps MV 65-1-41	Dredge		Cronan and Tooms, 1969		Emission spectrography	0.07	0.05	0.01	1.18	34.12			19.0
124	084	21°40'N 113°30'W	3,420	Scripps DH-8	Dredge	Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.24	0.60	0.07	9.4	28.9			3.1
125	084	29°03'N 113°33'W	384/ 493	Scripps VS-78	Dredge	Nodule 8x6x5 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.04	0.01	0.01	0.86	38.9	1.2		4.8
126	084	21°33'N 113°48'W	3,660	Scripps DH-7	Dredge	Nodule	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.24	0.62	0.05	7.5	24.4			3.3
127	084	21°21'N 114°06'W	3,660	Scripps DH-6	Dredge	Nodule	Mero, 1965	Half nodule	X-ray fluorescence spectrography	1.35	0.72	0.08	9.0	28.9			3.2
128	084	21°27'N 114°07'W	3,800	Scripps DH-5	Dredge	Nodule	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.23	0.62	0.11	10.9	27.6			2.5
129	084	21°31'N 114°08'W	3,800	Scripps DH-4	Dredge	Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.46	0.77	0.05	8.1	28.2			3.5

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
130	084	21°40'N 114°11'W	3,800	Scripps DH-3	Dredge	Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.19	0.64	0.09	9.9	28.8			3.0
131	084	21°50'N 115°12'W	3,430	Scripps DH-2	Dredge	Nodule 1 cm diam	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.02	0.50	0.11	13.0	25.1			2.0
132	084	27°20'N 116°10'W	4,030	Scripps PAS-19121	Corer	Nodule 0.5x2x2 cm	Mero, 1965	Whole nodule	Emission spectrography	1.25	0.70	0.27	9.3	21.2	6.2	1.0	2.3
133	084	22°00'N 116°14'W	3,480	Scripps DH-1	Dredge	Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.02	0.61	0.08	10.4	27.8			2.7
134	084	29°31'N 117°17'W	540/ 820	Scripps SOB-13D	Dredge	Crust	Scripps-NODC (unpublished)		X-ray fluorescence spectrography	0.22	0.04	0.73	15.6	21.1	1.1	2.1	1.4
135	084	20°19'N 117°29'W	4,010	Scripps Ris-5V	Corer (heat probe)	Nodule	Cronan and Tooms, 1969		Emission spectrography	1.26	0.68	0.26	10.46	24.13			2.3
136	084	23°30'N 119°35'W	440	Hend-1	Dredge	Crust	Scripps-NODC (unpublished)		X-ray fluorescence spectrography	0.36	0.04	0.62	13.5	20.5	1.2	2.1	1.5
137	084	25°15'N 119°40'W		U.S. Navy NEL-Hend	Dredge		Goldberg, 1954		Colorimetry	0.30	0.22	0.32	20.1	21.3			1.1
138	085	29°57'N 120°42'W	4,078/ 4,017	U.S.S.R. Vit-4217	Trawl	Nodule 4x2x2 cm	Skornyakova et al., 1962	X-sect.	Wet chemical and colorimetry	0.74	0.45	0.15	11.2	16.7	10.1	1.3	1.5
139	085	24°22'N 125°00'W	4,330	Scripps DWHH-4	Corer	Nodule 1x2x2 cm	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	1.21	0.49	0.24	9.5	18.5	5.7	1.3	2.0
						Nodule 0.8x2x2 cm	Scripps-NODC (unpublished)		Emission spectrography	1.7	0.69	0.33	13.3	25.9	7.9	0.5	1.1
140	085	28°59'N 125°40'W	4,000	Wig-6	Corer	Nodule 0.3 cm diam	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.51	0.34	0.37	13.6	14.3	8.7	1.1	1.2
141	085	29°58'N 125°55'W	4,325	U.S.S.R. Vit-4221		Nodule 2x1.5x1.5 cm	Mero, 1965	Half nodule	X-ray fluorescence spectrography	0.41	0.25	0.15	7.0	8.3	16.8	0.7	1.2
142	085	21°27'N 126°43'W	4,300	Scripps DWBD-1	Dredge		Cronan and Tooms, 1969		Emission spectrography	0.35	0.20	0.34	12.91	16.92			1.3
						Nodule 4x4x4 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.13	0.19	0.30	11.5	9.7	18.8	1.0	0.8
						Nodule 3.5 cm diam	Scripps-NODC (unpublished)		Emission spectrography	0.46	0.36	0.50	18.2	24.6	7.0	1.8	1.4
						Nodule 3.5 cm diam	Scripps-NODC (unpublished)		Emission spectrography	0.39	0.28	0.07	7.9	7.0	21.5	0.6	0.9
143	085	28°23'N 126°57'W	4,340	Harvard Alb-2	Trawl	Nodule	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.67	0.44	0.19	10.6	10.4	14.7	0.7	1.0

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
144	085	20°51'N 127°16'W	4,702	Scripps MP-3	Corer	Nodule	Mero, 1965	Outer 2 cm	X-ray fluorescence spectrography	1.10	0.76	0.36	9.2	21.2	7.9	1.4	2.3
145	086	20°00'N 130°01'W	4,895	U.S.S.R. Vit-4289	Dredge	Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	1.10	0.91	0.33	8.7	21.8	7.3	1.5	2.5
146	086	23°17'N 138°15'W	4,890	Scripps Naga-8C	Dredge		Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.35	0.20	0.52	14.1	15.9	6.5	1.4	1.1
147	086	29°10'N 139°55'W	4,890	Lamont RC11-D15	Dredge (pebble)	Nodule	Lamont (unpublished)		Wet chemical	0.26	0.14	0.09	17.4	12.5		1.4	0.7
148	087	21°30'N 140°00'W	5,378	Lamont RC11-D17	Dredge (pebble)	Nodule	Lamont (unpublished)		Wet chemical	1.00	0.54	0.23	10.5	21.0		1.0	2.0
149	087	23°17'N 141°13'W	5,540	Scripps Naga-10C	Corer	0.5x3 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.44	0.45	0.14	4.7	7.0	3.	0.7	0.7
							Hewett et al., 1963		Emission spectrography	0.7	0.3	0.3	>10.	>10.	3.	3.	
150	087	22°57'N 143°58'W	4,750	Scripps Hilo-4G	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.84	0.56	0.22	8.19	10.67			1.3
151	087	22°57'N 143°58'W	4,850	Scripps Hilo-5G	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.87	0.53	0.16	9.31	10.81			1.2
152	087	24°50'N 144°05'W	5,190	U.S.S.R. Vit-4239	Trawl (camera)		Mero, 1965		X-ray fluorescence spectrography	0.44	0.45	0.14	4.7	7.0	18.1	0.7	1.5
							Skornyakova et al., 1964		Wet chemical and colorimetry	0.46	0.43	0.10	5.17	12.49		1.3	2.4
153	087	23°54'N 148°00'W	5,220	Scripps Naga-15	Dredge	Nodule 1x3x3 cm	Mero, 1965		X-ray fluorescence spectrography	0.49	0.43	0.20	7.2	10.9	13.8	0.6	1.5
154	088	24°16'N 157°56'W	~3,968	Lamont RC12-188	Corer	Nodule	Lamont (unpublished)		Wet chemical	0.18	0.12	0.08	6.6	6.0			0.9
155	088	27°15'N 157°00'W	5,720	Lamont V21-D6	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	0.52	0.49	0.32	10.0	18.8		1.3	1.9
156	088	29°15'N 157°02'W	5,830	Lamont V21-D5	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	1.36	1.10	0.22	3.9	28.0		1.5	7.1
157	088	28°20'N 158°20'W	~5,360	Lamont RC12-187	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.96	0.30	0.28	10.1	15.2			1.5
158	088	28°24'N 159°11'W	5,680	Lamont V21-D4	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	0.62	0.27	0.32	11.6	16.4		1.6	1.4
159	088	23°01'N 159°21'W	4,856	Lamont V21-D8	Trawl (biology)	Crust	Lamont (unpublished)		Wet chemical	0.01	0.02	0.01	3.00	0.40			0.1

TABLE 3. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
160	089	27°36'N 161°54'W	4,947	Lamont RC13-15	Corer (piston)	Nodule	Lamont (unpublished)		Atomic absorption	0.54	0.32	0.24	10.0	16.0			1.6
161	090	20°03'N 171°38'W	3,477	U.S.S.R. Vit-4331	Spoon	Nodule	Skornyakova et al., 1962	Outer layer	Wet chemical and colorimetry	0.27		0.46	17.7	26.8	6.6	2.3	1.5
162	090	24°00'N 175°40'W	5,318	U.S.S.R. Vit-4347	Scoop	Nodule	Skornyakova et al., 1968		Wet chemical and colorimetry	0.76	0.53	0.42	12.38	20.16			1.6
163	091	27°42'N 175°10'E	5,750	Scripps Jyn IV-11G	Corer (gravity)	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.81	0.52	0.26	13.87	20.20			1.5
164	091	23°55'N 173°40'E		U.S.S.R. Vit-3782		Crust	Nikolayev and Yefimova, 1963			0.38			13.40	19.15		1.6	1.4
165	091	23°57'N 170°58'E	5,817	U.S.S.R. Vit-4351	Spoon	Nodule	Skornyakova et al., 1964	Outer layer	Wet chemical and colorimetry	0.53	0.38	0.46	11.91	20.22	6.0	1.8	1.7
							Skornyakova et al., 1964		Wet chemical and colorimetry	1.09		0.39	13.24	20.69		1.7	1.6
166	092	24°01'N 163°02'E	5,542	U.S.S.R. Vit-4359	Spoon	Nodule	Skornyakova et al., 1962	Core	Wet chemical and colorimetry	0.54		0.32	11.2	17.2	9.5	2.4	1.5
						Nodule	Skornyakova et al., 1964		Wet chemical and colorimetry	0.41	0.29	0.36	14.59	16.08		1.6	1.1
						Nodule	Skornyakova et al., 1964		Wet chemical and colorimetry	0.48		0.25	14.52	17.10		1.7	1.2
167	092	24°04'N 160°46'E	3,951	U.S.S.R. Vit4362	Spoon	Nodule	Skornyakova et al., 1962		Wet chemical and colorimetry	0.49		0.47	11.3	22.5	6.1	2.8	2.0
168	093	26°12'N 153°44'E	6,120	U.S.S.R. Vit-4370	Trawl	Crust	Skornyakova et al., 1962	Outer layer	Wet chemical and colorimetry	0.41		0.36	14.6	16.1	7.2	1.6	1.1
						Nodule	Mero, 1965	Whole nodule	Emission spectrography	0.41	0.27	0.14	14.0	12.2	8.2	1.5	0.9
169	093	27°20'N 150°10'E	5,286			Nodule	Goldberg, 1954		Colorimetry	0.27	0.50	0.19	17.0	14.5			0.9
170	120	30°12'N 117°38'W	1,300	Scripps SOB-10D	Dredge	Crust	Cronan and Tooms, 1969		Emission spectrography	0.20	0.03	0.56	15.15	14.23			0.9
						Crust	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.18	0.04	0.40	14.7	10.7	11.8	1.5	0.7
171	120	31°19'N 117°38'W	2,100/ 2,120	Scripps SOB-5D	Trawl	Crust	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.34	0.06	0.08	11.4	13.4	12.5	0.9	1.2
172	120	30°18'N 117°40'W	1,060	Scripps SOB-27D	Dredge	Crust	Cronan and Tooms, 1969		Emission spectrography	0.59	0.04	0.59	11.85	14.40			1.2
							Scripps-NODC (unpublished)		X-ray fluorescence spectrography	0.24	0.08	0.23	12.3	7.8	15.6	1.0	0.6

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
173	120	32°50'N 118°00'W	~2,000	S Clem	Dredge	Mn coated steel frag.	Goldberg and Arrhenius, 1958	Coating		0.02	0.05	0.01		0.1		0.2	
174	120	31°23'N 118°03'W	1,040	Scripps SOB-20D	Dredge		Cronan and Tooms, 1969		Emission spectrography	0.45	0.06	0.58	12.92	19.40			1.5
						Crust	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.23	0.05	0.53	14.5	13.7	12.5	1.6	0.9
175	120	32°45'N 118°13'W	1,588	S Clem-SV	Dredge	15 cm diam	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.19	0.05	0.14	16.1	14.5	9.8	1.6	0.9
176	120	31°05'N 118°37'W	1,830/ 1,650	Scripps SOB-25D	Dredge		Cronan and Tooms, 1969		Emission spectrography	0.48	0.13	0.20	9.22	14.59			1.6
							Scripps-NODC (unpublished)		X-ray fluorescence spectrography	0.13	0.04	0.26	16.4	11.8	12.0	1.6	0.7
177	120	31°21'N 119°03'W	695	Scripps SOB-22D	Dredge	Crust	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.24	0.06	0.19	10.3	11.7	12.4	0.7	1.1
178	122	32°56'N 132°30'W	710	U.S. Navy NEL-667	Dredge	Crust	Dietz, 1955		Colorimetry	0.40		0.90	11.4	25.6			2.2
179	122	39°38'N 135°06'W	4,790	Lamont V20-72	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.46	0.24	0.30	16.1	17.0		0.9	1.1
180	122	35°07'N 137°53'W	5,035	U.S.S.R. Vit-4199	Dredge		Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.33	0.29	0.29	13.0	10.4	13.4	1.1	0.8
181	122	31°51'N 139°58'W	4,991	Lamont RC11-D14	Dredge (pebble)	Nodule	Lamont (unpublished)		Wet chemical	0.62	0.38	0.31	18.5	17.3		1.2	0.9
182	123	39°56'N 140°02'W	~4,748	Lamont RC11-D13	Dredge (pebble)	Nodule	Lamont (unpublished)		Wet chemical	0.50	0.28	0.26	14.3	15.5		1.2	1.1
183	123	34°04'N 145°56'W	5,390	Scripps UPWD-1	Dredge		Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.67	0.45	0.34	11.8	15.7	11.3	1.1	1.3
184	123	34°08'N 145°57'W	5,300	Scripps UPWD-2	Dredge		Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.59	0.34	0.34	11.6	15.0	11.3	1.2	1.3
185	124	30°22'N 154°56'W	5,400	Challenger Chal-256	Dredge	Nodule 3x4x3 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.68	0.43	0.31	10.4	13.9	14.6	1.2	1.3
						Nodule 3 cm diam	Murray and Renard, 1891		Wet chemical	-1.	-1.5	-0.5	13.7	25.0	9.3	1.4	1.8
186	124	38°09'N 156°25'W	5,720	Challenger Chal-253	Dredge		Murray and Renard, 1891		Wet chemical	-1.	-1.	-0.5	15.48	16.6	10.9	2.0	1.1

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
187	124	31°31'N 159°42'W	5,720	Lamont V21-D3	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	0.52	0.44	0.40	12.2	19.2		1.3	1.6
188	125	37°52'N 160°17'W	5,020	Challenger Chal-252	Trawl	Nodule 6x6x8 cm	Riley and Sinhaseni, 1958	Whole nodule	Spectrography	0.40	0.26	0.13	12.4	19.9	8.8	1.0	1.6
						Nodule	Murray and Renard, 1891		Wet chemical	~1.	~0.2		14.32	18.0	13.0	1.8	1.3
						Nodule	Murray and Renard, 1891		Wet chemical	0.4	0.5	0.25	13.10	16.05	10.0	2.0	1.2
						Nodule	Murray and Renard, 1891		Wet chemical		~0.5		12.48	16.1	12.9	2.0	1.3
189	125	34°54'N 160°19'W	5,577	Lamont V21-D2	Trawl (biology)	Nodule	Lamont (unpublished)		Wet chemical	0.07	0.05	0.04	10.6	5.00		2.1	0.5
190	125	35°02'N 166°28'W	5,902/ 5,913	U.S.S.R. Vit-4090	Trawl	Nodule	Skornyakova et al., 1962	Outer 0.8 cm	Wet chemical and colorimetry	0.61		0.36	11.2	15.9	10.7	1.6	1.4
						Nodule	Skornyakova et al., 1962		Wet chemical and colorimetry	0.41		0.33	12.13	15.77	8.7	1.6	1.3
						Nodule	Skornyakova et al., 1962		Wet chemical and colorimetry	0.64		0.31	10.57	18.69	8.5	1.4	1.8
191	126	35°00'N 172°57'W	5,971	U.S.S.R. Vit-4084	Spoon	Nodule	Skornyakova et al., 1962	Outer 0.5 cm	Wet chemical and colorimetry	0.29		0.22	10.8	13.1	12.9	1.6	1.2
192	126	36°30'N 173°16'W	4,195	Scripps Ck-16	Corer		Scripps-NODC (unpublished)		Emission spectrography	0.50	0.50	0.39	9.5	14.5	13.1	1.4	1.5
193	127	37°41'N 177°04'E	5,300	Challenger Chal-248	Trawl	Nodule	Riley and Sinhaseni, 1958	Whole nodule	Spectrography	0.28	0.43	0.09	10.3	16.5	11.2	1.2	1.6
194	128	37°03'N 166°34'E	4,978	Lamont RC11-D5	On camera frame	Nodule	Lamont (unpublished)		Wet chemical	0.26	0.14	0.09	17.4	12.5		1.4	0.7
195	128	34°47'N 160°40'E	4,226	Lamont RC10-176	Corer (piston)	Nodule	Lamont (unpublished)		Wet chemical	0.12	0.16	0.10	15.9	9.60		1.1	0.6
196	130	36°29'N 146°43'E	5,720	Scripps Jyn II-21	Corer (gravity)	Nodule 2.5x1x1 cm	Mero, 1965	Whole nodule	X-ray fluorescence spectrography	0.12	0.07	0.00	11.8	1.9	26.4	1.3	0.2
197	130	38°00'N 146°00'E	3,500	Univ. of Tokyo JEDS-5	Trawl	Crust 3 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.38	0.10	0.29	13.9	19.8	3.3	2.2	1.4
198	157	40°23'N 127°59'W	1,260	Scripps Fan-BD-25	Dredge	Crust 1 cm	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.61	0.04	0.43	8.8	23.5	7.1	1.2	2.7
							Ahrens et al., 1967		Emission spectrography	0.42	0.02	0.50	14.1	21.0		2.4	1.5
							Hewett et al., 1963		Emission spectrography	0.3	0.07	0.3	>10.	>10.		3.	

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
199	157	42°45'N 128°03'W	2,520	Cas D-5	Dredge		Scripps-NODC (unpublished)		Emission spectrography	0.16	0.06	0.17	21.7	15.2	13.5	1.8	0.7
							Scripps-NODC (unpublished)		Emission spectrography	0.15	0.05	0.16	21.7	17.5	13.	2.1	0.8
							Scripps-NODC (unpublished)		X-ray fluorescence spectrography	0.11	0.04	0.12	15.7	12.8	9.4	1.5	0.8
						Nodule 3x2x2 cm	Ahrens et al., 1967		Emission spectrography	0.32	0.03	0.45	19.6	22.8		2.2	1.2
200	157	40°16'N 128°28'W	4,060/ 4,400	Scripps Fan-BD-20	Dredge	Nodule	Cronan and Tooms, 1969		Emission spectrography	0.44	0.37	0.10	10.12	11.76			1.2
						Nodule	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.56	0.37	0.07	8.4	18.8	12.6	1.1	2.2
						Nodule	Ahrens et al., 1967	Pieces	Emission spectrography	0.55	0.45	0.12	8.75	20.3		1.3	2.3
201	158	40°20'N 135°47'W	4,471/ 4,477	U.S.S.R. Vit-4191	Corer, Trawl	Nodule 3 cm diam	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.58	0.22	0.36	9.5	16.5	13.3	1.4	1.7
						Nodule	Skornyakova et al., 1964		Wet chemical and colorimetry	0.48	0.21	0.29	14.05	16.06		1.7	1.1
						Nodule	Skornyakova et al., 1968		Wet chemical and colorimetry	0.47	0.21	0.29	11.51	16.65			1.5
202	158	42°02'N 139°57'W	~ 4,116	Lamont RC11-D12	Dredge (pebble)	Nodules 2x2x1 cm	Lamont (unpublished)		Wet chemical	0.24	0.08	0.24	23.0	19.0		1.6	0.8
203	159	43°58'N 140°38'W	4,350	Scripps Cusp-8P	Corer	Nodule 1.2 cm diam	Mero, 1965	X-sect.	X-ray fluorescence spectrography	0.72	0.42	0.23	9.4	17.7	11.8	1.7	1.9
204	160	40°14'N 155°55'W	4,938			Nodule from crust	Ahrens et al., 1967	Half nodule	Emission spectrography	0.28	0.29	0.35	12.0	14.3		1.5	1.2
205	160	40°14'N 155°55'W	5,029	Scripps NH-C10	Caught in core wire	Crust ("Horizon")	Mero, 1965	Outer 2 cm	X-ray fluorescence spectrography	0.45	0.47	0.23	6.9	11.9	13.9	1.0	1.7
							Goldberg, 1954		Colorimetry	0.63		0.25	11.6	13.2			1.1
206	160	41°08'N 159°54'W	5,435/ 5,456	U.S.S.R. Vit-4104	Trawl	Nodule	Skornyakova et al., 1962	Outer layer	Wet chemical and colorimetry	0.43		0.31	8.92	13.25	14.7	1.9	1.5
207	162	40°24'N 175°42'W	6,065	U.S.S.R. Vit-4074	Trawl	Nodule	Skornyakova et al., 1962	Outer layer	Wet chemical and colorimetry	0.22	0.16	0.13	10.7	12.0	14.4	1.9	1.1

TABLE 2. CHEMICAL ANALYSES OF FERROMANGANESE NODULES AND CRUSTS - NORTH PACIFIC

Map no.	Mrsdn. Sq.	Location Lat. Long.	Depth m	Institution Number	Method of sampling	Description of FeMn	Publication or source	Portion analyzed	Analytical method	Results of Chemical Analyses in Weight Percent							
										Ni	Cu	Co	Fe	Mn	Si	Ca	Mn/Fe
208	163	40°30'N 170°48'E	5,460	Scripps Jyn II-9G	Corer		Cronan and Tooms, 1969		Emission spectrography	0.22	0.12	0.15	12.77	6.97			0.5
209	163	44°28N 170°15'E	1,258	U.S.S.R. Vit-3150	Trawl	Nodule	Skornyakova et al., 1962	Outer 1 cm	Wet chemical and colorimetry	0.12		0.41	7.8	33.9	2.8	1.9	4.3
210	195	56°10'N 145°15'W	1,370/ 1,800	Scripps NH-D7	Dredge (chainbag)	Crust	Goldberg, 1954		Colorimetry	0.45	0.40	0.26	13.1	20.9			1.6
211	196	52°47'N 150°05'W	1,500	Scripps NH-D1	Dredge (chainbag)	Crust	Goldberg, 1954		Colorimetry	0.32	0.21	0.31	14.8	19.4			1.3

TABLE 3

PHYSICAL PROPERTIES OF THE SUBSTRATE

AS DETERMINED BY ANALYSIS OF SAMPLES

FROM THE TOPS OF PISTON CORES

NORTH PACIFIC

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
1	010	06°19'N	90°37'W	3,647	V24-38	1.14	2.22	401.94	90	9.05					
2	010	04°45'N	90°56'W	3,032	RC13-139	1.37	2.62	133.84	78	3.56					
3	010	08°27'N	91°33'W	3,493	RC10-248	1.23	2.31	216.19	83	5.06					
4	010	06°37'N	91°52'W	3,579	RC13-135	1.19	2.95	342.12	91	10.24					
5	010	04°21'N	93°16'W	3,338	RC10-57	1.40	2.52	114.37	74	2.92					
6	010	04°53'N	93°34'W	3,413	V24-39	1.29	2.64	183.55	83	4.90					
7	010	01°49'N	94°08'W	2,655	RC13-138	1.31	2.43	159.28	79	3.92					
8	010	06°08'N	94°47'W	3,660	RC10-58	1.18	2.19	276.33	86	6.14					
9	010	09°39'N	95°23'W	4,098	RC13-134	1.13	2.76	522.84	93	14.63					
10	010	00°06'N	95°39'W	3,231	RC13-110	1.30	2.28	149.98	77	3.47					
11	010	00°51'N	96°02'W	3,436	RC13-137	1.20	2.11	239.73	83	5.12					
12	010	05°34'N	96°19'W	3,662	RC10-59	1.26	2.77	218.85	86	6.15					
13	010	03°04'N	97°08'W	3,204	V24-40	1.38	2.98	144.42	81	4.36					
14	010	00°50'N	97°28'W	3,446	V21-208	1.40	2.72	123.69	77	3.41					
15	010	07°52'N	97°39'W	3,484	RC13-132	1.15	2.62	427.93	91	11.38					
16	011	03°20'N	101°43'W	3,120	RC10-62	1.35	2.40	129.50	75	3.14					
17	011	02°19'N	104°27'W	3,468	RC10-63	1.41	2.56	111.84	74	2.89					
18	011	01°49'N	105°41'W	3,499	RC10-64	1.40	2.51	116.26	74	2.95					
19	011	03°11'N	106°23'W	3,667	V21-205	1.46	2.56	96.55	71	2.50					
20	011	00°58'N	106°54'W	3,687	RC13-118	1.27	2.21	164.37	78	3.68					
21	011	05°25'N	106°54'W	3,821	RC13-121	1.36	2.70	145.30	79	3.97					
22	011	02°32'N	107°13'W	3,792	RC13-119	1.41	2.62	114.42	75	3.03					
23	011	03°51'N	107°14'W	3,753	RC13-120	1.39	2.78	131.94	78	3.72					
24	011	00°41'N	108°37'W	3,588	RC10-65	1.32	2.57	160.69	80	4.18					
25	011	01°43'N	109°20'W	3,720	V24-48	1.39	2.55	122.57	75	3.16					
26	012	06°50'N	110°28'W	3,696	RC10-75	1.42	2.82	122.53	77	3.50					
27	012	04°23'N	110°53'W	3,928	V21-203	1.44	2.78	113.16	76	3.19					
28	012	05°42'N	111°37'W	4,100	RC10-74	1.28	2.89	211.70	86	6.20					
29	012	00°49'N	112°44'W	3,878	V24-49	1.33	2.30	132.84	75	3.09					
30	012	02°48'N	113°37'W	3,780	RC10-72	1.32	2.34	141.02	76	3.34					
31	012	05°03'N	113°49'W	4,039	V21-202	1.42	2.49	105.85	72	2.67					
32	012	01°48'N	114°32'W	3,856	V24-50	1.35	2.40	129.01	75	3.13					
33	012	01°27'N	114°42'W	3,860	RC10-71	1.36	2.43	125.76	75	3.10					
34	012	01°20'N	114°54'W	3,891	RC10-70	1.37	2.66	137.89	78	3.71					
35	013	01°40'N	120°20'W	4,409	V24-51	1.30	2.58	176.65	82	4.62					
36	013	07°18'N	125°20'W	4,610	RC10-93	1.24	2.69	240.87	86	6.57					

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
37	013	01°51'N	129°01'W	4,473	V24-53	1.43	2.38	94.89	69	2.29					
38	014	08°38'N	130°11'W	4,890	V21-197	1.18	2.26	300.27	87	6.88					
39	014	09°48'N	136°11'W	4,819	V21-196	1.20	2.50	281.03	87	7.11					
40	014	02°14'N	136°15'W	4,341	V24-56	1.43	2.39	97.71	70	2.37					
41	014	08°47'N	139°53'W	5,086	RC11-206	1.20	2.57	299.86	88	7.81					
42	015	01°41'N	140°03'W	4,420	RC11-210	1.37	2.35	115.86	73	2.76					
43	015	03°39'N	140°04'W	4,400	RC11-209	1.43	2.51	101.55	72	2.58					
44	015	02°16'N	141°40'W	4,490	V24-58	1.35	2.53	138.66	78	3.55					
45	015	04°39'N	144°58'W	4,868	RC12-65						0.00	1.71	45.31	52.98	2.90
46	015	02°34'N	145°32'W	4,662	V24-59	1.31	2.72	173.56	82	4.78					
47	015	02°37'N	148°13'W	4,755	RC12-66						0.00	2.13	40.38	57.59	2.45
48	015	02°48'N	149°00'W	4,859	V24-60	1.17	2.76	368.95	91	10.33	0.00	0.59	32.15	67.26	1.72
49	016	01°21'N	153°04'W	4,420	RC13-63	1.38	2.44	118.58	74	2.92					
50	016	03°06'N	153°09'W	4,846	RC13-62	1.40	2.50	113.80	74	2.88					
51	016	05°22'N	153°11'W	4,786	RC13-61	1.24	2.24	201.63	82	4.57					
52	016	06°52'N	153°19'W	5,017	RC13-60	1.11	1.58	305.03	83	4.89					
53	016	03°04'N	153°35'W	4,834	V24-62	1.54	2.89	89.29	72	2.61	0.00	10.75	33.12	56.13	3.06
54	016	09°37'N	153°42'W	5,203	RC13-59	1.16	1.87	257.38	83	4.89					
55	016	04°10'N	159°04'W	3,933	V24-64	1.66	2.69	59.29	61	1.61					
56	017	09°31'N	160°50'W	4,868	RC13-57	1.26	2.25	184.69	80	4.21					
57	017	08°53'N	164°26'W	4,925	RC13-56	1.47	2.97	109.08	76	3.27					
58	017	07°31'N	164°60'W	4,982	RC12-81	1.28	2.48	184.66	82	4.63					
59	017	04°32'N	165°01'W	4,854	RC12-82	1.34	3.01	170.73	83	5.21					
60	017	08°32'N	166°58'W	5,161	RC13-51	1.16	2.13	316.99	87	6.83					
61	017	00°22'N	167°10'W	5,393	RC13-48	1.24	2.64	239.42	86	6.41					
62	017	09°41'N	168°42'W	5,222	RC12-195	1.22	2.92	278.42	89	8.23					
63	018	05°43'N	170°55'W	5,901	RC13-20	1.13	2.88	561.21	94	16.37					
64	018	08°33'N	170°59'W	5,169	RC13-19	1.21	2.30	250.26	85	5.84					
65	018	02°28'N	171°08'W	5,298	RC13-21	1.14	2.16	387.80	89	8.49					
66	018	00°02'N	175°04'W	5,218	RC13-23	1.26	2.47	201.97	83	5.06					
67	018	04°57'N	175°04'W	5,316	RC13-24	1.16	2.58	382.13	90	10.01					
68	019	01°28'N	174°52'E	4,691	RC12-200	1.32	2.78	174.30	83	4.91					
69	019	06°41'N	177°14'E	5,482	RC13-32	1.23	2.80	262.65	88	7.46					
70	019	07°35'N	178°25'E	~5,565	RC12-199	1.15	2.19	357.33	88	7.94					
71	021	06°46'N	150°23'E	4,451	RC10-149	1.26	2.32	183.58	81	4.32					
72	023	03°04'N	135°33'E	4,464	V24-140	1.33	2.62	155.85	80	4.14					

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
73	024	09°10'N	124°12'E	1,524	RC12-358	1.35	3.18	169.24	84	5.46					
74	024	07°21'N	120°31'E	4,276	V24-135	1.30	2.73	182.94	83	5.06					
75	024	08°58'N	120°14'E	2,049	RC12-357	1.30	2.62	179.18	82	4.75					
76	025	07°27'N	114°33'E	525	RC12-353	1.41	3.43	146.88	83	5.10					
77	025	07°30'N	114°30'E	1,344	RC12-355	1.33	2.58	155.58	80	4.07					
78	025	07°30'N	114°13'E	1,390	RC12-356	1.36	2.96	158.01	82	4.73					
79	025	07°30'N	114°13'E	1,161	RC12-354	1.38	2.73	135.09	78	3.73					
80	025	06°00'N	114°01'E	2,303	RC12-352	1.23	2.65	252.96	87	6.79					
81	025	05°02'N	113°35'E	1,229	RC12-351	1.39	2.43	115.53	74	2.85					
82	025	06°33'N	111°13'E	1,950	RC12-350	1.28	2.73	205.13	85	5.68					
83	027	08°44'N	94°12'E	3,797	RC12-348	1.21	2.85	297.87	89	8.61					
84	027	09°08'N	90°02'E	3,010	RC12-339	1.43	2.78	114.63	76	3.22					
85	046	10°26'N	91°16'W	3,716	RC12-30	1.19	2.33	276.07	86	6.52					
86	046	12°60'N	92°39'W	4,034	RC12-32	1.30	2.48	168.28	80	4.23					
87	046	14°50'N	93°57'W	412	RC12-33	1.44	2.97	118.85	78	3.57					
88	046	10°01'N	94°02'W	3,797	RC12-133	1.17	2.46	343.95	89	8.57					
89	046	11°34'N	96°45'W	4,330	RC13-131	1.15	2.32	372.01	89	8.73					
90	046	11°08'N	98°44'W	3,680	RC10-245	1.19	2.36	277.50	86	6.63					
91	046	12°27'N	99°02'W	3,451	RC13-130	1.21	2.76	298.11	89	8.34					
92	046	16°09'N	99°39'W	5,365	RC13-128	1.42	2.85	124.15	78	3.58					
93	047	13°55'N	100°14'W	3,649	RC13-129	1.15	2.02	329.42	87	6.76					
94	047	12°50'N	100°32'W	3,455	RC13-124	1.18	2.51	323.26	89	8.23					
95	047	12°45'N	101°12'W	3,382	RC13-125	1.17	3.11	412.58	92	13.01					
96	047	12°08'N	101°30'W	3,288	RC13-127	1.19	3.32	380.87	92	12.83					
97	047	12°09'N	102°12'W	3,147	RC13-126	1.14	2.60	465.50	92	12.27					
98	047	12°50'N	103°19'W	3,012	RC13-123	1.23	2.60	245.84	86	6.49					
99	048	15°08'N	113°28'W	3,919	RC10-89	1.15	2.22	370.36	89	8.35					
100	051	19°29'N	140°02'W	5,574	RC11-199	1.33	2.59	151.47	79	3.97					
101	051	14°52'N	140°02'W	4,828	RC11-200	1.39	2.46	116.14	74	2.89					
102	051	12°32'N	140°05'W	4,996	RC11-202	1.21	2.31	251.53	85	5.88					
103	051	11°42'N	142°48'W	5,099	V21-194	1.15	2.20	373.83	89	8.33					
104	051	10°02'N	143°38'W	5,253	RC10-103	1.18	2.06	253.41	84	5.28					
105	052	13°44'N	150°00'W	5,218	V21-191	1.26	2.41	191.30	82	4.67					
106	052	16°49'N	154°11'W	4,947	V21-189	1.27	2.42	183.54	81	4.50					
107	052	10°22'N	157°08'W	5,343	RC13-58	1.23	2.26	215.23	83	4.92					
108	053	19°20'N	160°17'W	4,826	RC12-191	1.21	2.42	253.69	86	6.22					

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Map no.	Marsden Square	Location Lat.	Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	sand %	silt %	clay %	Mean Size μ
109	053	13°57'N	160°58'W	5,737	RC13-55	1.28	2.75	201.23	84	5.60					
110	053	16°28'N	161°43'W	5,590	RC12-78	1.38	2.57	128.52	77	3.35					
111	053	16°57'N	163°00'W	5,773	RC12-192	1.30	2.77	186.59	83	5.24					
112	053	13°50'N	163°32'W	5,460	RC12-79	1.29	2.48	172.60	81	4.34					
113	053	13°58'N	163°46'W	5,546	RC13-54	1.25	2.69	226.87	86	6.17					
114	053	17°31'N	164°41'W	5,473	V24-72	1.36	2.80	147.97	80	4.20					
115	053	16°05'N	165°52'W	5,295	RC12-193	1.40	2.47	112.40	73	2.81					
116	053	19°34'N	166°39'W	5,242	RC13-16	1.17	2.93	386.20	91	11.48					
117	053	16°29'N	166°47'W	5,234	V24-73	1.38	2.98	145.79	81	4.41					
118	053	13°57'N	167°00'W	5,442	RC13-53	1.45	2.60	101.16	72	2.66					
119	053	11°59'N	167°02'W	5,176	RC13-52	1.26	2.61	208.76	84	5.51					
120	053	13°49'N	167°18'W	5,152	RC12-194	1.40	3.05	138.07	81	4.27					
121	053	14°53'N	169°51'W	5,669	V24-74	1.38	2.61	126.58	77	3.35					
122	054	14°20'N	170°55'W	4,429	V24-75	1.35	2.75	153.47	81	4.28					
123	054	10°51'N	175°03'W	4,605	RC13-25	1.44	2.49	99.53	71	2.51					
124	054	13°51'N	175°14'W	4,217	RC13-26	1.52	2.74	88.67	71	2.46					
125	054	13°52'N	175°18'W	4,488	RC13-28	1.29	2.78	199.42	84	5.62					
126	055	13°10'N	178°53'E	~3,336	V24-101	1.66	2.72	60.04	62	1.65					
127	055	13°55'N	178°20'E	5,506	RC13-30	1.27	2.62	207.02	84	5.50					
128	055	12°18'N	177°11'E	5,638	RC13-31	1.28	3.43	236.06	89	8.20					
129	055	10°53'N	173°00'E	5,374	V24-80	1.19	2.29	280.93	86	6.52					
130	056	19°52'N	162°58'E	4,808	V24-88	1.44	2.46	96.82	70	2.41					
131	056	19°04'N	161°23 E	~4,879	V24-87	1.35	2.87	158.68	82	4.61					
132	056	19°03'N	161°19'E	~3,985	V24-86	1.63	2.93	72.25	68	2.14					
133	056	16°48'N	161°04'E	5,603	V24-84	1.30	2.90	194.36	85	5.70					
134	057	17°51'N	158°52'E	5,510	V24-85	1.35	2.94	164.07	83	4.89					
135	057	18°05'N	152°57'E	5,218	RC12-129	1.36	2.56	136.01	77	3.53					
136	057	11°19'N	152°05'E	5,861	V24-113	1.27	2.52	195.05	83	4.99					
137	057	14°42'N	150°33'E	5,993	V24-114						0.00	1.92	20.36	77.72	1.08
138	059	15°32'N	136°24'E	4,184	V21-119	1.36	2.79	148.22	80	4.19					
139	059	15°16'N	135°22'E	4,987	V21-120	1.41	2.88	129.82	79	3.79					
140	059	19°34'N	134°30'E	5,826	V21-116	1.41	2.60	114.00	75	3.00					
141	059	15°07'N	133°20'E	4,746	V21-122	1.42	2.44	101.28	71	2.50					
142	060	13°00'N	127°03'E	5,075	V21-126	1.40	2.66	122.22	76	3.29					
143	060	15°06'N	124°08'E	3,528	RC12-361	1.59	2.94	79.65	70	2.37					
144	060	18°11'N	120°04'E	3,189	V24-128	1.63	2.50	56.57	58	1.43					

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
145	061	14°14'N	119°50'E	2,518	V24-126	1.81	2.60	37.74	49	.99					
146	063	11°12'N	95°08'E	2,692	RC12-345	2.69	3.24	9.95	24	.32					
147	063	15°10'N	90°34'E	2,666	RC12-343	1.41	2.62	116.42	75	3.08					
148	063	12°42'N	90°01'E	3,012	RC12-340	1.38	2.55	124.78	76	3.22					
149	085	21°15'N	125°07'W	4,468	RC10-237	1.52	2.89	92.31	72	2.70	0.00	0.01	21.27	78.72	1.00
150	085	22°58'N	128°17'W	4,491	RC10-236	1.54	2.85	86.06	71	2.49	0.00	0.00	12.49	87.51	0.83
151	085	28°38'N	129°06'W	4,281	RC10-234	1.54	2.95	89.90	72	2.68	0.00	0.17	18.08	81.75	0.96
152	085	25°50'N	129°25'W	4,737	RC10-235	1.48	2.54	89.42	69	2.30	0.00	0.00	17.67	82.33	0.94
153	086	29°11'N	139°55'W	4,927	RC11-196						0.00	0.00	15.50	84.50	0.85
154	087	21°31'N	140°00'W	5,378	RC11-198						0.00	0.15	13.81	86.04	0.97
155	088	28°00'N	151°10'W	5,338	V20-66						0.00	0.01	15.05	84.94	0.83
156	088	25°51'N	153°12'W	5,363	V20-65						0.00	0.04	18.76	81.20	0.98
157	088	23°21'N	155°52'W	4,205	V20-64						0.00	0.66	31.35	67.99	1.50
158	088	27°15'N	157°00'W	5,711	V21-183	1.47	2.47	89.90	69	2.25	0.00	0.00	20.13	79.87	1.09
159	088	29°51'N	157°02'W	5,824	V21-182	1.44	2.79	112.48	76	3.18	0.00	0.03	15.59	84.38	0.93
160	088	27°36'N	157°30'W	5,506	RC13-10						0.00	0.01	16.00	83.99	.92
161	088	27°44'N	157°44'W	5,583	RC13-8						0.00	0.02	16.28	83.72	.94
162	088	27°33'N	157°50'W	5,504	RC13-9						0.00	0.01	15.43	84.56	.90
163	088	23°53'N	157°52'W	4,431	RC12-189	1.42	2.66	116.28	75	3.13					
164	088	25°03'N	157°54'W	4,804	V21-184	1.51	2.82	94.33	72	2.69	0.00	0.05	22.17	77.78	1.06
165	088	20°47'N	157°56'W	1,476	RC12-173	1.51	2.98	98.66	74	2.98					
166	088	24°16'N	157°56'W	~3,968	RC12-188	1.34	2.41	137.51	77	3.36					
167	088	20°55'N	158°06'W	2,992	V21-59						0.00	1.96	43.82	54.22	2.13
168	088	28°12'N	158°07'W	5,544	RC12-437	1.53	2.77	85.38	70	2.40					
169	088	20°51'N	158°09'W	3,751	V21-60	1.52	2.57	80.66	67	2.10	0.00	1.52	51.14	47.34	3.05
170	088	20°52'N	158°09'W	3,762	V21-187	1.48	2.50	88.17	69	2.23	0.00	1.58	50.84	47.58	2.84
171	088	28°20'N	158°20'W	~5,360	RC12-187	1.38	2.29	108.97	71	2.52					
172	088	28°51'N	158°21'W	5,302	V21-181	1.45	2.68	104.39	73	2.83	3.97	0.06	15.00	80.97	0.93
173	088	22°27'N	158°23'W	4,927	RC12-190	1.33	2.55	152.38	79	3.93					
174	088	28°24'N	159°11'W	5,676	V21-180						0.00	0.01	15.46	84.47	0.79
175	088	23°01'N	159°21'W	4,857	V21-185	1.51	2.94	96.73	74	2.88	0.00	1.46	74.11	24.44	9.24
176	089	21°36'N	161°26'W	4,583	V21-61	1.49	2.80	96.68	73	2.74	0.00	0.39	37.24	62.37	1.92
177	089	22°14'N	165°14'W	4,625	V21-62	1.60	2.77	72.40	67	2.03	0.00	0.02	48.56	51.42	2.08
178	089	22°51'N	169°41'W	4,674	V21-63	1.69	2.53	48.34	55	1.24	0.00	0.02	16.91	83.07	0.99
179	090	23°27'N	173°13'W	4,867	V21-64	1.59	2.60	67.71	64	1.78	0.00	0.00	20.61	79.39	1.17
180	090	29°05'N	174°35'W	5,340	V20-100						0.00	0.01	22.00	77.99	1.07

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181	090	23°58'N	176°51'W	5365	V21-65						0.00	0.00	16.57	83.43	0.88
182	090	28°18'N	176°57'W	4460	V20-101						0.00	0.16	42.95	56.89	2.58
183	090	24°48'N	178°04'W	5447	V24-97	1.45	2.52	97.05	71	2.48					
184	091	24°31'N	179°21'E	5601	V21-66	1.63	2.86	69.12	66	2.00	0.00	0.02	19.12	80.86	0.95
185	091	26°34'N	177°46'E	5700	V24-94	1.28	2.46	182.82	82	4.56					
186	091	27°36'N	177°46'E	5287	V24-95	1.48	2.64	93.99	71	2.51					
187	091	24°58'N	176°16'E	5879	V21-67	1.64	2.72	62.34	63	1.71	0.00	0.00	11.28	88.72	0.84
188	091	25°48'N	176°13'E	5782	V24-93	1.48	2.86	104.44	75	3.02					
189	091	24°57'N	174°00'E	5909	V24-92	1.42	2.65	114.69	75	3.08					
190	091	25°31'N	172°45'E	5964	V21-68						0.00	0.00	19.05	80.95	0.97
191	091	23°39'N	170°52'E	5936	V24-91	1.46	2.77	105.45	74	2.95					
192	092	26°26'N	169°02'E	5982	V21-69	1.51	2.54	80.88	67	2.08	0.00	0.00	23.72	76.28	1.13
193	092	27°05'N	166°04'E	5954	V21-70						0.00	0.00	20.36	79.64	1.05
194	092	20°52'N	165°07'E	5544	V24-89	1.25	2.41	203.77	83	4.97					
195	092	27°54'N	162°31'E	5954	V21-71	1.65	2.48	52.73	57	1.32	0.43	0.03	25.10	74.44	1.22
196	092	28°07'N	160°36'E	5892	RC10-158	1.51	2.62	84.78	69	2.25	0.00	0.05	20.77	79.18	1.09
197	093	24°46'N	159°08'E	5682	RC10-157	1.46	2.61	97.59	72	2.57	0.00	0.08	25.27	74.65	1.27
198	093	28°47'N	158°50'E	5369	V21-72	1.45	2.61	101.90	72	2.70	0.00	0.29	17.35	82.36	0.89
199	093	22°20'N	157°49'E	5402	RC10-156	1.37	2.39	118.73	74	2.88	0.00	0.04	38.57	61.39	1.17
200	093	28°19'N	156°53'E	6190	RC12-405	1.43	2.86	121.41	77	3.51					
201	093	27°30'N	156°36'E	6128	RC12-408	1.36	2.82	151.72	81	4.34					
202	093	25°44'N	154°58'E	5768	RC12-407	1.22	2.36	238.16	85	5.70					
203	093	25°35'N	154°37'E	5801	RC12-406	1.22	2.64	258.61	87	6.93					
204	093	29°28'N	154°36'E	5872	V21-73	1.38	2.47	118.95	74	2.97	0.00	0.21	25.51	74.28	1.20
205	093	20°25'N	151°34'E	5801	RC12-130	1.17	2.41	336.18	89	8.21					
206	093	29°51'N	150°50'E	6015	V21-74						0.00	0.44	27.26	72.30	1.34
207	094	20°55'N	149°55'E	3177	RC11-158						0.00	1.78	63.70	34.52	5.90
208	094	26°48'N	142°54'E	4025	RC11-160						0.00	2.17	43.77	54.06	2.54
209	094	23°26'N	149°17'E	5804	RC12-131	1.51	2.68	87.86	70	2.38					
210	094	26°40'N	146°47'E	5431	RC12-132	1.47	2.62	95.33	71	2.52					
211	094	29°06'N	144°25'E	5854	RC12-133	1.27	2.47	193.48	82	4.84					
212	094	27°54'N	140°03'E	3702	V21-83	1.64	2.31	45.39	51	1.06					
213	094	27°57'N	141°22'E	4116	V21-84						0.00	1.60	23.06	75.34	1.19
214	094	27°58'N	142°30'E	1684	V21-85	1.60	2.39	56.84	57	1.37	0.00	73.16	15.41	11.43	87.70
215	094	27°53'N	145°03'E	5717	V21-86	1.41	2.49	107.92	73	2.72	0.00	2.28	26.36	71.36	2.11
216	094	27°53'N	146°35'E	5879	V21-87	1.53	2.43	72.14	64	1.78	0.00	2.87	36.55	60.58	2.16

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217	094	23°35'N	145°39'E	5821	V21-89	1.52	2.61	82.68	68	2.18	0.00	0.96	57.57	41.47	6.91
218	094	23°57'N	144°23'E	5841	V21-90	2.00	2.99	33.38	50	1.01	0.00	21.33	42.85	35.82	9.82
219	094	23°25'N	143°23'E	5128	V21-91	1.44	2.51	101.19	72	2.57	0.00	0.88	73.51	25.61	8.33
220	094	23°00'N	143°10'E	4283	V21-92	1.55	2.79	83.37	70	2.35	0.00	1.93	61.49	36.58	5.44
221	094	24°37'N	142°28'E	2878	V21-93	1.38	2.53	125.86	76	3.23	0.00	42.11	52.13	5.76	56.30
222	094	28°33'N	146°53'E	5949	V21-140						0.00	0.70	34.62	64.68	1.78
223	095	27°56'N	138°13'E	4565	V21-82	1.46	2.90	111.07	76	3.26					
224	095	24°38'N	136°56'E	4971	V21-137	1.36	2.45	129.53	76	3.21					
225	095	29°02'N	136°30'E	4352	V21-81	1.75	2.58	43.68	53	1.14					
226	095	23°41'N	136°05'E	4868	V21-97	1.44	2.96	121.16	78	3.63					
227	095	29°41'N	134°47'E	4799	RC12-142	1.39	2.90	139.15	80	4.09	0.00	0.77	47.10	52.13	2.93
228	095	23°06'N	134°26'E	2135	V21-98	1.62	2.81	68.74	66	1.95					
229	095	23°27'N	134°04'E	5042	V21-136	1.44	3.12	125.85	79	3.97					
230	095	29°46'N	133°17'E	~2350	RC12-143	1.46	2.55	95.77	71	2.47					
231	095	23°32'N	132°14'E	5148	V21-99	1.42	2.44	104.09	72	2.57					
232	095	29°07'N	132°14'E	4931	RC12-144	1.39	2.39	109.60	72	2.65					
233	095	29°20'N	131°58'E	5620	RC12-145	1.34	2.25	124.98	74	2.84					
234	095	23°35'N	131°26'E	5233	V21-100	1.34	2.48	144.07	78	3.62					
235	095	29°33'N	131°25'E	3922	RC12-146	1.45	2.35	88.78	67	2.11					
236	095	21°28'N	130°03'E	5929	V21-135	1.40	2.68	124.54	77	3.38					
237	096	23°55'N	127°58'E	5960	V21-112	1.43	2.43	100.32	71	2.47					
238	096	20°43'N	126°23'E	5298	V21-134	1.69	2.68	54.94	59	1.49					
239	096	26°35'N	126°20'E	1644	RC12-366	1.48	2.97	107.49	76	3.24					
240	096	23°57'N	126°11'E	2787	RC12-365	1.54	2.60	77.31	67	2.04					
241	096	21°45'N	125°35'E	4936	RC12-364	1.46	2.77	106.23	74	2.98					
242	121	37°58'N	128°34'W	4726	RC10-231	1.42	3.16	134.77	81	4.31	0.00	0.00	33.19	66.81	1.32
243	121	35°35'N	128°39'W	4674	RC10-232	1.40	2.54	114.18	74	2.93	0.00	0.25	13.33	86.42	0.73
244	122	39°38'N	133°41'W	4773	V20-73						0.00	1.45	14.64	83.91	0.83
245	122	39°38'N	135°06'W	4790	V20-72						0.00	0.14	16.38	83.48	0.90
246	122	37°42'N	137°51'W	5302	V20-71						0.00	0.01	17.16	82.83	0.85
247	122	35°00'N	139°57'W	5303	RC11-194	1.44	2.50	98.06	71	2.48	0.00	0.00	15.14	84.86	0.87
248	122	31°51'N	139°58'W	4934	RC11-195	1.42	2.42	99.80	70	2.44	0.00	0.00	14.59	85.41	0.86
249	123	39°56'N	140°02'W	4748	RC11-193	1.44	2.63	105.55	73	2.81	0.00	0.01	16.86	83.13	0.92
250	123	35°42'N	140°51'W	5207	V20-70						0.00	1.00	17.75	81.25	0.89
251	123	30°58'N	146°48'W	5788	V20-68						0.00	0.00	19.49	80.51	0.92
252	123	30°33'N	148°12'W	5042	V20-67						0.00	1.55	15.63	82.82	0.94

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253	124	39°12'N	153°25'W	5706	V20-89						0.00	0.12	17.32	82.56	0.87
254	124	38°48'N	155°37'W	5991	V20-90						0.00	0.05	19.57	80.38	0.97
255	124	37°18'N	157°42'W	5863	V20-91						0.00	0.01	20.44	79.55	0.99
256	124	38°00'N	158°57'W	5576	RC12-184	1.34	2.44	139.00	77	3.43					
257	124	32°25'N	158°58'W	5993	RC12-186	1.36	2.49	132.39	76	3.34					
258	124	35°16'N	159°00'W	5929	RC12-185	1.37	2.87	145.18	80	4.22					
259	124	30°43'N	159°34'W	5771	V21-179						0.00	0.03	16.59	83.38	0.87
260	124	36°18'N	159°38'W	5764	V20-92						0.00	0.27	19.63	88.10	0.98
261	124	31°31'N	159°42'W	5720	V21-178	1.49	2.88	100.79	74	2.94	0.00	0.27	24.85	74.88	1.25
262	124	31°12'N	159°45'W	5885	RC12-436	1.32	2.58	163.14	81	4.26					
263	125	33°52'N	160°08'W	6022	V21-177	1.41	2.51	110.90	73	2.81	0.00	0.00	16.44	83.56	0.97
264	125	34°54'N	160°19'W	6521	V21-176						0.00	0.03	18.03	81.94	0.96
265	125	32°43'N	160°34'W	5781	RC12-435	1.45	2.78	110.71	75	3.12					
266	125	38°22'N	161°06'W	5654	V21-175	1.39	2.52	118.89	75	3.03	0.00	0.01	21.96	78.03	1.14
267	125	35°27'N	161°28'W	5797	V20-93						0.00	0.03	21.95	78.02	1.03
268	125	36°13'N	162°40'W	5900	RC12-434	1.43	3.05	127.22	79	3.93					
269	125	36°13'N	162°40'W	5900	RC12-433	1.39	2.98	142.26	81	4.29					
270	125	34°36'N	163°14'W	5993	V20-94						0.00	0.09	24.12	75.79	1.05
271	125	38°51'N	164°02'W	5097	RC12-432	1.39	2.80	135.26	79	3.84					
272	125	33°56'N	164°47'W	5804	V20-95						0.00	0.05	16.61	83.34	0.81
273	125	33°02'N	166°42'W	5771	V20-96						0.00	0.05	31.62	68.33	1.72
274	125	32°04'N	168°44'W	5841	V20-97						0.00	0.04	17.87	82.09	0.95
275	126	31°10'N	170°35'W	5673	V20-98						0.00	0.03	20.45	79.52	0.99
276	126	30°21'N	172°17'W	5486	V20-99						0.00	0.02	19.91	80.07	0.99
277	126	31°11'N	177°49'W	5216	V20-102						0.00	0.02	26.65	73.33	4.57
278	126	33°58'N	177°50'W	3442	V20-103						0.00	1.37	41.13	57.50	2.37
280	126	37°18'N	178°10'W	5449	V20-104						0.00	0.02	77.44	22.54	7.77
281	126	39°00'N	178°17'W	5336	V20-105						0.00	0.86	37.89	61.25	1.33
282	127	39°38'N	173°43'E	4312	RC10-179						0.00	0.11	31.08	68.81	1.47
283	127	37°48'N	172°20'E	5808	RC10-178	1.23	2.32	221.80	83	5.22	0.00	0.00	25.87	74.13	0.67
284	127	37°12'N	170°51'E	5302	RC10-177	1.25	2.67	226.39	85	6.13	0.00	0.00	27.16	72.84	1.22
285	127	38°06'N	170°01'E	3849	RC12-417	1.50	2.60	85.64	69	2.25					
286	128	36°24'N	166°44'E	5319	RC12-416	1.32	2.79	175.96	83	4.97					
287	128	37°03'N	166°34'E	4978	RC11-165	1.22	2.31	230.17	84	5.38					
288	128	34°03'N	164°50'E	6088	V21-145						0.18	0.06	30.27	69.49	1.68

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
289	128	35°48'N	163°43'E	5550	RC12-411	1.36	2.95	157.53	82	4.71					
290	128	37°41'N	163°02'E	3968	V21-146	1.36	2.42	126.56	75	3.10	0.00	0.95	33.93	65.12	1.98
291	128	35°20'N	162°38'E	5158	RC11-164	1.29	2.35	163.83	79	3.90	0.00	0.04	29.79	70.17	1.24
292	128	31°13'N	162°18'E	5894	RC10-159	1.45	2.51	96.22	71	2.45	0.00	0.12	26.04	73.84	1.22
293	128	39°33'N	162°05'E	5256	V21-147	1.20	2.27	254.71	85	5.86	0.00	0.08	32.10	69.82	1.42
294	128	32°23'N	161°19'E	5693	RC12-410	1.36	2.72	144.89	79	3.99					
295	128	34°47'N	160°40'E	4226	RC10-176	1.40	2.32	104.11	71	2.45	0.00	1.36	36.70	61.94	2.00
296	128	32°41'N	160°01'E	4931	V21-144	1.36	2.85	152.05	81	4.38	0.00	0.05	23.37	76.58	1.26
297	129	32°28'N	159°50'E	4621	RC10-160	1.36	2.47	129.65	76	3.24	0.00	0.43	28.98	70.59	1.37
298	129	30°18'N	159°15'E	5742	RC12-409	1.40	2.88	133.49	79	3.89					
299	129	34°35'N	159°10'E	4014	RC10-175	1.40	2.49	113.99	74	2.87	0.00	1.47	35.03	63.50	1.65
300	129	31°25'N	158°48'E	3913	RC10-162	1.46	2.52	92.75	70	2.37	0.00	1.66	39.36	58.98	2.33
301	129	33°05'N	158°00'E	3587	RC10-161	1.59	2.83	76.32	68	2.18	0.00	0.58	36.23	63.19	2.23
302	129	32°35'N	157°35'E	3191	RC10-174	1.62	2.72	65.62	64	1.80	0.00	1.98	34.90	63.12	1.91
303	129	31°44'N	157°30'E	3766	RC10-164						0.00	1.58	44.31	54.11	2.73
304	129	32°43'N	157°30'E	3550	RC10-163	1.75	2.70	48.18	56	1.32	0.00	1.70	51.63	46.67	4.16
305	129	38°47'N	157°24'E	5612	V20-128						0.00	0.16	28.96	70.88	1.43
306	129	35°51'N	157°20'E	3592	V21-143						0.39	29.01	36.39	34.21	12.28
307	129	31°50'N	157°20'E	3792	RC10-166						0.00	1.00	46.62	52.38	2.99
308	129	37°41'N	156°35'E	5766	V20-129						0.00	0.24	38.46	61.30	1.73
309	129	37°41'N	156°27'E	4056	RC10-173	1.34	1.98	97.19	66	1.95	0.00	2.47	35.86	61.67	1.89
310	129	31°35'N	156°25'E	4241	V21-142	1.44	2.88	117.31	77	3.42	0.00	0.63	34.44	64.93	1.58
311	129	31°16'N	155°30'E	5068	RC12-404	1.32	2.86	178.87	83	5.19					
312	129	32°08'N	154°38'E	4387	RC10-172	1.58	2.82	77.97	69	2.22	0.00	2.91	32.41	64.68	1.86
313	129	30°48'N	154°04'E	5821	V21-141	1.42	2.78	118.77	77	3.35	0.00	1.97	44.18	53.85	3.62
314	129	32°28'N	153°02'E	5544	RC10-171	1.60	2.76	71.51	66	2.00	0.00	1.11	33.64	65.25	1.74
315	129	39°32'N	152°42'E	5559	RC11-163	1.33	2.63	156.13	80	4.16	0.00	1.44	31.09	67.47	1.55
316	129	36°52'N	152°33'E	5912	RC12-403	1.24	2.44	225.32	84	5.57					
317	129	32°29'N	152°14'E	5621	RC10-170	1.53	2.82	87.87	71	2.51	0.00	0.76	33.54	65.70	1.71
318	129	32°31'N	151°04'E	5740	RC10-169	1.38	2.64	130.02	77	3.48	0.00	1.43	45.24	53.33	2.30
319	129	33°24'N	150°23'E	6092	RC10-167	1.52	2.78	88.16	71	2.48	0.00	1.57	46.66	51.77	2.97
320	130	30°04'N	147°41'E	6119	V21-75						0.00	0.62	30.21	69.17	1.55
321	130	38°49'N	145°45'E	5243	RC12-166	1.26	2.39	197.30	82	4.79					
322	130	30°25'N	144°30'E	5916	V21-76	1.46	2.50	92.87	70	2.35	0.00	1.26	45.66	53.08	2.66
323	130	37°04'N	143°51'E	~6485	RC12-165	1.53	2.63	81.61	68	2.17					
324	130	32°55'N	142°32'E	6306	V20-136						0.00	10.40	41.60	48.00	3.68

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size ·μ
325	130	36°27'N	141°53'E	2319	RC12-164	1.28	2.48	184.26	82	4.64					
326	130	32°39'N	141°50'E	6736	RC12-135	1.34	2.64	153.27	80	4.09					
327	130	32°58'N	140°34'E	1503	V20-133						0.00	44.25	36.15	19.60	40.50
328	130	33°05'N	140°25'E	1106	V21-78						0.66	88.07	7.47	3.80	571.00
329	131	34°43'N	139°55'E	2598	V20-135						0.00	0.62	53.63	45.75	3.65
330	131	33°12'N	139°02'E	1763	RC11-162	1.45	2.51	95.12	70	2.41					
331	131	34°02'N	138°23'E	4400	V21-80	1.47	2.43	85.04	67	2.09					
332	131	32°15'N	138°17'E	3782	RC12-161	1.22	2.18	211.41	82	4.67					
334	131	33°00'N	138°02'E	4030	RC12-162	1.34	2.68	153.82	80	4.17					
335	131	33°14'N	137°54'E	~3673	RC12-136	1.37	2.71	137.29	79	3.77					
336	131	33°30'N	137°52'E	4001	RC12-163	1.35	2.55	142.65	78	3.69					
337	131	31°31'N	137°47'E	4091	RC12-160	1.31	2.71	176.39	82	4.84					
338	131	30°52'N	137°44'E	4189	RC12-154	1.38	2.42	117.23	74	2.88					
339	131	39°47'N	137°36'E	2840	RC12-397	1.29	2.33	158.72	78	3.75					
340	131	31°44'N	137°08'E	4228	RC12-155	1.40	2.54	114.95	74	2.96					
341	131	31°38'N	137°07'E	4281	RC12-159	1.41	2.77	123.70	77	3.47					
342	131	30°10'N	137°04'E	4486	RC12-153	1.34	2.55	144.05	78	3.72					
343	131	32°28'N	136°35'E	4318	RC12-156	1.40	2.55	114.75	74	2.96					
344	131	38°55'N	136°30'E	2650	RC12-389	1.20	2.26	264.07	85	6.06					
345	131	31°06'N	136°27'E	4449	RC11-161	1.44	2.39	92.05	69	2.22					
346	131	39°07'N	136°08'E	2496	RC12-388	1.19	2.34	274.84	86	6.52					
347	131	39°42'N	136°02'E	1103	RC12-390	1.40	2.39	107.60	72	2.61					
348	131	39°59'N	135°43'E	898	RC12-391	1.50	2.51	83.59	68	2.13					
349	131	39°59'N	135°43'E	1008	RC12-392	1.45	2.59	101.64	72	2.67					
350	131	37°15'N	135°42'E	1622	RC12-380	1.23	2.24	215.64	83	4.90					
351	131	31°54'N	135°36'E	4449	RC12-158	1.38	2.71	135.04	78	3.70					
352	131	30°44'N	135°23'E	4259	RC12-152	1.38	2.45	117.56	74	2.92					
353	131	32°32'N	135°16'E	4784	RC12-157	1.37	2.62	132.29	77	3.51					
354	131	36°54'N	134°33'E	1010	RC12-379	1.21	2.13	229.44	83	4.96					
355	131	36°57'N	134°32'E	1401	RC12-378	1.24	2.38	210.32	83	5.08					
356	131	30°36'N	134°13'E	4515	RC12-141	1.37	2.90	146.12	81	4.30	0.00	3.10	42.66	54.24	2.81
357	131	31°50'N	134°12'E	4876	RC12-140	1.34	2.63	149.40	79	3.97					
358	131	32°18'N	134°09'E	3153	RC12-139	1.29	2.74	191.91	84	5.33					
359	131	33°00'N	134°09'E	605	RC12-138	1.63	2.49	55.03	58	1.39					
360	131	30°44'N	134°04'E	4464	RC12-151	1.42	2.74	119.59	76	3.31	0.00	4.60	45.04	50.36	3.41

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
361	131	38°55'N	133°48'E	1437	RC12-381	1.28	2.37	170.99	80	4.10					
362	131	39°43'N	133°07'E	2113	RC12-383	1.23	2.36	219.27	83	5.24					
363	131	31°03'N	132°50'E	4854	RC12-150	1.46	2.59	98.24	72	2.58					
364	131	39°55'N	132°40'E	3027	RC12-382	1.23	2.94	269.95	88	8.05					
365	131	37°35'N	132°15'E	2226	RC12-377	1.22	2.48	253.40	86	6.37					
366	157	45°35'N	126°09'W	2582	RC10-229	1.30	2.48	166.32	80	4.18	0.00	0.53	20.67	78.80	0.96
367	157	48°12'N	126°10'W	1657	V20-75						0.00	0.37	38.87	60.76	1.81
368	157	45°56'N	127°00'W	2765	RC10-228	1.32	2.98	184.17	84	5.56	0.00	0.12	22.51	77.37	1.20
369	157	47°54'N	127°12'W	2582	RC11-186	1.24	2.07	182.31	79	3.83	0.00	0.13	22.18	77.69	1.06
370	157	47°27'N	127°16'W	2534	RC10-226	1.28	2.49	183.79	82	4.63	0.00	0.11	29.18	70.71	1.22
371	157	47°54'N	127°39'W	2628	V20-76						0.00	0.01	24.82	75.17	1.13
372	157	48°45'N	127°45'W	2536	RC10-225	1.26	2.40	198.44	82	4.82	0.00	0.20	24.13	75.67	1.16
373	157	46°18'N	128°00'W	2774	RC10-227	1.19	2.13	255.07	84	5.52	0.00	0.08	15.57	84.35	0.89
374	157	40°28'N	128°25'W	3200	RC10-230	1.51	2.73	88.98	71	2.45	0.00	1.90	37.29	62.52	1.67
375	157	47°42'N	128°40'W	2659	V20-77						0.00	2.32	24.68	73.00	1.38
376	158	47°09'N	130°07'W	~2670	RC11-187	1.35	2.47	133.82	77	3.35	0.00	0.30	22.72	66.98	1.53
377	158	49°04'N	130°57'W	1159	RC10-224						63.09	32.82	2.36	1.73	3249.00
378	158	47°15'N	131°02'W	2983	V20-78						0.00	0.17	33.06	66.77	1.67
379	158	46°44'N	131°35'W	3319	RC11-188						0.00	0.36	26.27	73.37	1.48
380	158	41°04'N	132°22'W	3749	V20-74						0.00	0.12	27.85	72.03	1.21
381	158	46°50'N	133°18'W	3711	V20-79						0.00	0.10	29.33	70.57	1.41
382	158	45°58'N	134°25'W	3922	RC11-189	1.44	2.78	111.81	75	3.15	0.00	0.00	50.95	49.05	2.36
383	158	49°18'N	134°39'W	3645	RC10-223	1.34	2.26	123.98	73	2.83	0.00	0.00	32.53	67.47	1.31
384	158	43°30'N	135°00'W	3801	V20-80						0.00	0.83	48.64	50.53	3.18
385	158	49°57'N	135°14'W	3559	RC10-222	1.44	2.66	106.59	74	2.87	0.00	0.07	38.37	61.56	1.88
386	158	45°56'N	138°14'W	4294	V20-82						0.00	2.52	30.87	66.61	1.30
387	158	44°57'N	138°22'W	4254	RC11-190						0.00	0.00	21.58	78.42	1.00
388	158	45°45'N	139°24'W	4345	V20-83						0.00	0.32	23.28	76.40	1.01
389	158	42°02'N	139°57'W	4116	RC11-192	1.48	2.70	95.21	72	2.60	0.00	1.38	34.83	63.79	1.73
390	158	44°31'N	139°57'W	4387	RC11-191						0.00	0.00	16.75	83.27	0.82
391	159	49°43'N	140°31'W	3959	RC11-184						0.00	1.50	32.98	65.52	1.46
392	159	45°27'N	141°11'W	4457	V20-84						0.00	0.17	27.30	72.53	1.15
393	159	48°00'N	143°25'W	4438	RC11-185						0.00	1.11	34.68	64.21	1.58
394	159	44°54'N	143°37'W	3817	V20-85						0.00	0.71	22.01	77.28	1.05
395	159	43°37'N	148°06'W	5138	V20-86						0.00	0.07	15.91	84.02	0.81
396	159	41°48'N	149°55'W	4819	V20-87						0.00	0.08	20.83	79.09	0.98

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397	160	40°11'N	151°39'W	5081	V20-88						0.00	0.44	23.63	75.93	1.20
398	160	45°43'N	157°14'W	4929	RC12-175	1.24	2.54	227.13	85	5.85					
399	160	46°07'N	157°48'W	~5267	RC12-182	1.41	2.64	118.03	75	3.15					
400	160	43°00'N	157°50'W	5365	RC12-176	1.33	2.32	135.28	76	3.17					
401	160	47°09'N	158°57'W	5141	RC12-181	1.35	2.69	149.86	80	4.09					
402	160	44°00'N	159°02'W	5449	RC12-183	1.33	2.42	142.48	77	3.49					
403	160	46°36'N	159°40'W	5167	RC11-171						8.87	1.58	39.57	49.98	3.76
404	161	40°08'N	162°30'W	5691	V21-174	1.36	2.35	120.20	74	2.86	0.00	0.09	20.23	79.68	0.95
405	161	44°29'N	163°21'W	5451	RC11-170						0.00	0.56	24.61	74.83	1.21
406	161	44°22'N	163°33'W	5493	V21-173						0.00	1.40	25.51	73.09	2.50
407	161	49°53'N	164°57'W	5013	V21-171	1.75	2.40	36.76	47	0.89	0.00	0.71	72.78	26.51	7.84
408	161	48°38'N	167°49'W	5749	RC12-431	1.43	2.39	97.19	70	2.35					
409	162	44°37'N	170°03'W	6081	RC10-205	1.34	2.74	155.18	81	4.30	6.18	0.63	24.97	68.22	1.50
410	162	42°10'N	170°14'W	5665	RC11-169	1.34	2.88	163.25	82	4.75	0.00	0.04	22.59	77.37	1.23
411	162	47°13'N	170°26'W	5497	RC10-206	1.33	2.29	134.74	75	3.12	0.00	1.97	34.07	63.96	1.84
412	162	47°24'N	171°30'W	5638	RC12-430	1.42	2.89	123.62	78	3.61					
413	162	41°42'N	171°57'W	5883	RC10-203	1.30	2.67	177.96	82	4.81	0.00	0.07	22.92	77.01	1.05
414	162	45°37'N	173°00'W	5523	RC10-202	1.33	2.69	163.40	81	4.45	0.00	1.02	29.76	69.22	1.49
415	162	48°32'N	173°13'W	5158	RC10-201	1.42	2.59	112.66	74	2.96	4.89	3.84	31.92	59.35	2.27
416	162	43°24'N	178°52'W	5872	V20-107						0.00	1.15	27.20	71.65	1.24
417	162	45°27'N	179°15'W	5625	V20-108						16.99	0.16	23.31	59.54	6.83
418	162	47°19'N	179°39'W	5629	V20-109						0.00	1.26	34.52	64.22	1.96
419	163	49°31'N	179°04'E	4986	RC10-184	1.32	2.45	153.43	79	3.81	0.00	0.69	37.97	61.34	1.98
420	163	45°37'N	177°52'E	5561	RC10-182						0.00	1.97	31.11	66.92	1.50
421	163	44°05'N	176°50'E	5698	RC10-181	1.37	2.61	131.63	77	3.48	3.19	0.24	29.58	66.99	1.53
422	163	43°46'N	171°14'E	5841	RC11-166	1.32	2.54	154.72	79	3.98	0.00	0.74	45.51	53.75	2.71
423	164	47°57'N	168°47'E	2739	V20-119						0.00	2.54	67.37	30.09	9.35
424	164	47°24'N	167°45'E	6216	V20-120						0.00	0.93	38.37	60.70	2.15
425	164	40°41'N	166°59'E	5656	RC12-412	1.31	2.69	172.70	82	4.71					
426	164	43°17'N	166°54'E	5015	RC12-413	1.38	2.72	136.78	79	3.77					
427	164	46°58'N	164°16'E	5859	V20-121						0.00	1.08	42.59	57.33	2.52
428	164	41°17'N	164°09'E	4872	RC12-415	1.33	2.78	167.08	82	4.70					
429	164	44°17'N	163°18'E	5291	RC12-414	1.43	2.64	109.47	74	2.93					
430	164	48°00'N	162°01'E	5416	V21-150						0.00	1.88	34.77	63.35	2.16
431	164	46°34'N	161°41'E	5563	V20-122						0.00	0.24	40.58	59.18	2.19
432	164	42°05'N	160°36'E	5477	V21-148						0.00	2.25	33.79	63.96	1.80

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
433	164	45°08'N	160°28'E	5665	V21-149						0.00	2.81	58.49	38.70	6.17
434	165	46°15'N	157°55'E	4903	V20-123						0.00	0.74	44.57	54.69	2.55
435	165	40°17'N	156°55'E	5583	V20-127						0.00	0.36	38.28	61.36	1.84
436	165	42°09'N	155°52'E	5515	V20-126						0.00	0.57	37.30	62.13	2.03
437	165	45°50'N	154°30'E	5534	V20-124						0.00	2.38	45.43	52.19	2.77
438	165	43°29'N	154°22'E	5545	V20-125						0.00	0.14	43.75	56.11	2.50
439	165	42°07'N	151°37'E	5097	RC12-172	1.19	2.51	296.14	88	7.55					
440	165	40°11'N	150°44'E	5332	RC12-402	1.23	2.58	243.40	86	6.37					
441	166	42°21'N	149°58'E	4940	RC12-171	1.43	2.14	78.51	62	1.70					
442	166	42°39'N	148°12'E	7240	RC12-170	1.36	2.31	119.50	73	2.80					
443	166	40°50'N	148°08'E	5415	RC12-401	1.16	2.20	318.56	87	7.10					
444	166	43°00'N	146°04'E	1845	RC12-169	1.51	2.53	81.04	67	2.08					
445	166	40°57'N	144°56'E	~3862	RC12-168	1.42	2.84	122.98	77	3.53					
446	166	40°55'N	144°51'E	3900	RC12-400	1.22	2.22	225.45	83	5.07					
447	167	40°31'N	137°31'E	2664	RC12-398	1.29	2.79	196.12	84	5.54					
448	167	40°19'N	136°14'E	2338	RC12-394	1.37	2.84	148.01	81	4.26					
449	167	40°46'N	135°39'E	3048	RC12-393	1.18	2.81	365.67	91	10.43					
450	167	40°06'N	135°12'E	838	RC12-387	1.59	2.67	69.04	65	1.86					
451	167	40°48'N	134°36'E	3497	RC12-386	1.29	2.86	201.11	85	5.82					
452	167	40°50'N	134°26'E	3532	RC12-385	1.20	2.31	263.89	86	6.18					
453	167	40°00'N	133°17'E	2677	RC12-384	1.36	2.49	130.88	76	3.29					
454	194	51°03'N	139°33'W	3786	RC10-219	1.37	2.62	135.76	78	3.60	0.00	2.34	44.99	52.67	2.46
455	194	57°00'N	138°09'W	2957	RC11-177						0.00	0.31	30.88	68.81	1.39
456	194	51°29'N	136°59'W	3636	RC11-183						0.00	0.22	30.28	69.50	1.28
457	194	53°18'N	135°41'W	1289	RC11-181						1.38	90.83	6.17	3.00	351.00
458	194	51°03'N	133°44'W	3157	RC10-220	1.24	2.26	205.52	82	4.71	0.00	1.03	29.70	69.27	1.33
459	194	50°33'N	131°37'W	2834	RC10-221	1.40	2.71	123.48	77	3.38	0.00	0.10	33.20	66.70	1.57
460	195	50°57'N	146°05'W	4338	RC10-217	1.44	2.84	116.81	77	3.36	2.75	5.33	36.59	55.33	2.96
461	195	53°30'N	145°39'W	4067	RC11-179	1.42	2.61	113.96	75	3.01	0.00	2.51	36.07	61.42	2.32
462	195	56°57'N	144°44'W	3819	RC11-176	1.54	2.92	88.85	72	2.63	0.00	0.62	38.12	61.26	1.84
463	195	50°55'N	143°15'W	909	RC10-218						4.67	86.63	5.89	2.81	264.00
464	195	53°09'N	142°54'W	3860	RC11-180						14.52	1.45	29.48	54.55	7.07
465	195	55°11'N	140°15'W	1547	RC11-178						0.72	71.15	20.16	7.97	97.60
466	196	50°58'N	151°10'W	4989	RC10-216	1.56	2.65	75.44	66	2.02					
467	196	52°35'N	151°21'W	1618	RC11-174	1.83	2.76	41.06	53	1.14	50.75	31.89	12.42	4.94	2214.00
468	196	54°30'N	155°52'W	5517	RC12-180	1.52	2.54	79.41	67	2.04					

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Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
469	196	52°29'N	157°03'W	4601	RC12-179	1.33	2.75	166.54	82	4.65					
470	196	50°06'N	157°14'W	4903	RC12-174	1.42	2.51	106.04	72	2.69					
471	196	51°01'N	158°06'W	4887	RC10-215	1.55	2.44	67.36	62	1.67	17.00	0.30	47.14	35.56	17.33
472	196	53°54'N	158°24'W	6384	RC12-178	1.43	2.48	101.47	71	2.55					
473	197	52°52'N	163°45'W	6909	V21-167						0.00	27.08	63.79	9.13	35.60
474	197	50°59'N	164°08'W	4731	RC10-214	1.54	2.33	64.58	60	1.52	0.19	19.18	30.62	50.01	4.30
475	197	51°15'N	164°53'W	4808	RC11-172						0.00	2.16	38.81	59.03	2.06
476	197	53°12'N	164°58'W	3607	RC11-173	1.43	2.42	98.38	70	2.41	0.00	2.25	34.22	63.53	1.85
477	197	52°21'N	165°35'W	7011	V21-170						0.00	1.54	42.45	56.01	2.05
478	197	54°55'N	166°45'W	165	V21-168						0.33	47.47	44.43	7.77	59.50
479	197	51°49'N	167°45'W	7196	RC10-213						0.00	0.81	54.23	44.96	3.72
480	197	54°16'N	168°19'W	1858	V21-169						0.00	3.95	58.23	37.82	4.84
481	197	51°25'N	169°12'W	7103	V21-166						0.00	0.24	37.87	61.89	1.70
482	198	51°06'N	170°08'W	7231	RC10-212	1.27	2.27	175.38	80	4.03	0.00	0.21	35.43	64.36	1.78
483	198	50°55'N	171°33'W	7264	RC10-207	1.43	2.88	120.54	77	3.52	0.00	1.14	40.45	58.41	2.40
484	198	50°03'N	171°45'W	5137	RC10-211	1.42	2.52	107.09	73	2.73	0.00	2.00	46.38	51.62	3.98
485	198	51°38'N	171°46'W	3737	RC10-208	1.51	2.48	79.67	66	2.00	0.00	1.45	52.47	46.08	5.00
486	198	56°24'N	172°26'W	1919	V21-164	1.54	2.37	66.31	61	1.59	0.00	0.73	47.00	52.27	2.11
487	198	56°01'N	172°27'W	2576	V21-165						0.00	2.44	45.91	51.65	4.09
488	198	50°48'N	172°38'W	7284	RC10-210	1.44	2.38	92.53	69	2.23	0.00	1.68	38.57	59.75	2.17
489	198	53°04'N	173°18'W	2774	RC10-209						0.00	1.18	54.08	44.74	3.83
490	198	50°44'N	173°56'W	7317	RC10-200						0.00	0.09	33.93	65.98	1.37
491	198	51°19'N	174°01'W	4698	RC10-199	1.36	2.22	111.48	71	2.51	0.00	2.37	50.11	47.52	3.92
492	198	58°02'N	176°07'W	3270	V21-163						0.00	0.53	44.03	55.44	2.32
493	198	53°22'N	176°11'W	3731	V21-158						0.00	2.35	52.61	45.04	4.56
494	198	50°50'N	176°15'W	4874	RC11-167						0.00	2.17	60.41	37.42	5.37
495	198	58°33'N	177°13'W	2317	V21-162	1.52	2.74	87.97	70	2.44	0.00	2.28	66.50	31.22	7.88
496	198	53°12'N	177°41'W	3733	RC10-190	1.19	1.87	212.59	80	4.02	0.00	1.68	50.55	47.77	3.15
497	198	52°15'N	178°03'W	3422	RC10-189	1.39	2.29	102.98	70	2.39	0.00	22.62	54.08	23.30	16.63
498	198	53°54'N	178°30'W	3801	V20-113						0.00	0.76	43.90	55.34	2.55
499	198	52°48'N	178°42'W	3592	V20-112						0.00	1.49	54.83	43.68	4.54
500	198	55°01'N	179°01'W	3801	RC10-194	1.22	2.39	237.45	85	5.76	0.00	0.00	31.65	68.35	1.30
501	198	54°54'N	179°42'W	3810	V20-114						0.00	0.25	39.84	59.91	1.94
502	198	51°01'N	179°58'W	3851	V20-111						0.00	0.83	53.98	45.19	3.96
503	198	55°23'N	179°43'W	3813	V20-115						0.00	0.10	35.61	64.29	1.68
504	199	54°28'N	179°55'E	3414	RC12-420	1.34	2.74	155.07	81	4.31					

TABLE 3. PHYSICAL PROPERTIES OF THE SUBSTRATE AS DETERMINED BY ANALYSIS OF SAMPLES FROM THE TOPS OF PISTON CORES - NORTH PACIFIC

Map no.	Marsden Square	Location Lat.	Location Long.	Depth in meters	Lamont Core No.	Wet Density g/cc	Dry Density g/cc	Moisture Content % dry wt.	Porosity %	Void Ratio	Texture gravel %	Texture sand %	Texture silt %	Texture clay %	Mean Size μ
505	199	54°26'N	179°51'E	1853	RC12-421	1.39	2.43	112.05	73	2.75					
506	199	57°30'N	179°50'E	3779	V21-160	1.24	2.36	217.58	83	5.21	0.00	1.68	45.31	53.01	2.54
507	199	53°37'N	179°42'E	1628	RC12-429	1.18	2.50	321.41	89	8.16					
508	199	54°24'N	179°37'E	252	RC12-422	2.01	2.79	27.99	44	0.79					
509	199	59°34'N	179°15'E	3237	V21-161	1.20	2.08	229.19	82	4.83	0.00	4.65	43.73	51.62	2.55
510	199	53°15'N	179°12'E	3025	RC10-191	1.18	2.26	287.92	86	6.60	0.00	1.49	51.52	46.99	3.18
511	199	54°54'N	178°34'E	397	RC10-197	1.84	2.57	34.14	47	0.88	0.40	95.33	2.42	1.85	175.90
512	199	53°38'N	178°27'E	3684	RC10-192	1.18	2.01	255.44	83	5.20	0.00	1.09	46.57	52.34	2.53
513	199	53°47'N	177°24'E	3895	V20-116						0.00	1.23	41.52	57.25	2.28
514	199	50°12'N	177°11'E	6591	RC10-186	1.39	2.84	137.59	79	3.95	0.00	1.30	33.99	64.71	1.74
515	199	54°42'N	177°05'E	1007	RC10-196	1.33	2.66	156.53	80	4.22	0.00	17.88	53.09	29.03	12.09
516	199	54°39'N	177°00'E	1135	V21-157						0.00	13.31	46.06	40.63	5.25
517	199	55°58'N	176°56'E	3835	RC10-195	1.27	2.52	198.88	83	5.09	0.00	0.16	31.61	68.23	1.30
518	199	52°33'N	176°54'E	3673	RC10-188	1.43	2.57	106.36	73	2.77	0.00	1.59	40.41	58.00	2.52
519	199	53°01'N	176°23'E	3904	V20-117						0.00	1.35	47.28	51.37	3.18
520	199	55°05'N	176°20'E	3418	V21-156						0.00	0.86	52.44	46.70	4.00
521	199	54°36'N	175°46'E	2261	RC12-423	1.64	2.73	64.06	63	1.77					
522	199	50°40'N	175°40'E	6216	RC10-187	1.47	2.55	93.65	70	2.42	0.00	2.92	38.36	58.72	2.53
523	199	56°01'N	172°57'E	3826	RC12-424	1.28	2.47	180.82	81	4.52					
524	199	50°22'N	172°43'E	5360	V20-118						0.00	1.27	38.25	60.48	2.10
525	199	57°47'N	172°08'E	2999	V21-155	1.20	2.10	227.12	82	4.84	0.00	0.89	34.71	64.40	1.94
526	199	56°27'N	170°28'E	1531	RC12-425	1.42	2.77	118.70	76	3.33					
527	200	58°06'N	169°37'E	3338	V21-154	1.20	2.54	279.94	87	7.20	0.00	0.37	34.11	65.52	1.51
528	200	57°21'N	168°19'E	3532	V21-153	1.26	2.19	172.54	79	3.83	0.00	3.02	33.12	63.86	1.52
529	200	55°47'N	165°39'E	3279	V21-152	1.99	2.62	24.70	39	0.65	0.00	50.36	36.07	13.57	37.10
530	200	57°36'N	163°59'E	3160	RC12-426	1.28	2.68	194.73	84	5.28					
531	200	52°16'N	163°38'E	5055	V21-151						0.00	2.06	47.58	50.36	3.24

REFERENCES

USED AS SOURCE OF DATA GIVEN ON MAPS AND TABLES

REFERENCES
(Used as source of data given on Maps and Tables)

Agassiz, Alexander, 1906, Report of the expedition, in Reports on the Scientific Results of the Expedition to the Eastern Pacific by the U.S. Fish Commission Steamer "Albatross": Memoirs Museum Comparative Zoology, Harvard College, v. 33, pt. 5, p. 1-50.

Ahrens, L.H., Willis, J.P., and Oosthuizen, C.O., 1967, Further observations on the composition of manganese nodules, with particular reference to some of the rarer elements: Geochim. et Cosmochim. Acta, v. 31, p. 2169-2180.

Arrhenius, G., 1952, Description of the sediment cores, in Pettersson, Hans, Editor, Reports of the Swedish Deep-Sea Expedition 1947-1948; Sediment Cores from the East Pacific v. 5, pt. 2, p. 95-186.

——— 1963, Pelagic sediments, in Hill, M.N., Editor, The Sea: New York, John Wiley & Sons, v. 3, p. 655-727.

Barnes, S.S., and Dymond, J.R., 1967, Rates of accumulation of ferro-manganese nodules: Nature, v. 213, p. 1218-1219.

Bender, M.L., Ku, Teh-Lung, and Broecker, W.S., 1970, Accumulation rates of manganese in pelagic sediments and nodules: Earth and Planet. Sci. Letters, v. 8, p. 143-148.

Bonatti, Enrico, and Nayudu, Y.R., 1965, The origin of manganese nodules on the ocean floor: Am. Jour. Science, v. 263, p. 17-39.

Buchanan, J.Y., 1892, On the composition of oceanic and litteral manganese nodules: Royal Soc. Edinburgh Trans., v. 36, p. 459-485.

Carsola, A.J., and Dietz, R.S., 1952, Submarine geology of two flat-topped northeast Pacific seamounts: Am. Jour. Science, v. 250, p. 481-497.

Cronan, D.S., and Tooms, J.S., 1967, Geochemistry of manganese nodules from the N.W. Indian Ocean: Deep-Sea Research, v. 14, p. 239-249.

—— 1969, The geochemistry of manganese nodules and associated pelagic deposits from the Pacific and Indian Oceans: Deep-Sea Research, v. 16, p. 335-359.

Dietz, R.S., 1955, Manganese deposits of the Northeast Pacific sea floor: Calif. Jour. Mines and Geology, v. 51, p. 209-220.

Emery, K.O., and Shepard, F.P., 1945, Lithology of the sea floor off southern California: Geol. Soc. America Bull., v. 56, p. 431-478.

ESSA, 1965, International Indian Ocean Expedition, USC&GS Ship Pioneer - 1964, data report: oceanographic stations, BT observations, and bottom samples: U.S. Dept. Commerce, v. 2, 183 p.

Fisher, R.L., 1964, Pre;iminary results of Scripps Institution of Oceanography investigations in the Indian Ocean during Expeditions Monsoon and Lusiad 1960-1963: Univ. California, San Diego, 237 p. (S.I.O. Ref. 64-19).

Fleming, J.A., Sverdrup, H.U., Ennis, C.C., Seaton, S.L., and Hendrix, W.C., 1945, Oceanography-I-B, in Scientific Results of Cruise VII of the Carnegie during 1928-29, v. 1-B, 315 p.

Flint, J.M., 1905, A contribution to the oceanography of the Pacific: U.S. National Museum Bull. no. 55, 282 p.

Goldberg, E.D., 1954, Marine geochemistry 1. chemical scavengers of the sea: Jour. Geology, v. 62, p. 249-265.

Goldberg, E.D., and Arrhenius, G.O.S., 1958, Chemistry of Pacific pelagic sediments: Geochim. et Cosmochim. Acta, v. 13, p. 153-212.

Hamilton, E. L., 1956, Sunken islands of the Mid-Pacific Mountains: Geol. Soc. America Mem. 64, 97 p.

Hewett, D. F., Fleischer, Michael, and Conklin, Nancy, 1963, Deposits of the manganese oxides: supplement: Econ. Geology, v. 58, p. 1-51.

Krause, D. C., 1964, Lithology and sedimentation in the southern continental borderland, in Miller, R. L., Editor, Papers in Marine Geology: New York, Macmillan Company, p. 274-318.

Ku, Teh-Lung, and Broecker, W. S., 1969, Radiochemical studies on manganese nodules of deep-sea origin: Deep-Sea Research, v. 16, p. 625-637.

Kullenberg, Borje, 1955, Deep-sea coring, in Petterson, Hans, Editor, Reports of the Swedish Deep-Sea Expedition 1947-1948, bottom investigations: v. 4, no. 2, p. 37-96.

Lamont-Doherty Geological Observatory, Descriptions of cores, dredges and trawls: Palisades, New York, Columbia Univ., unpublished.

Menard, H. W., 1960, Consolidated slabs on the floor of the eastern Pacific: Deep-Sea Research, v. 7, p. 35-41.

——— 1964, Marine Geology of the Pacific: New York, McGraw-Hill Book Company, 271 p.

Menard, H. W., Goldberg, E. D., and Hawkes, H. E., Composition of Pacific sea-floor manganese nodules: Scripps data, unpublished.

Mero, J. L., 1962, Ocean-floor manganese nodules: Econ. Geology, v. 57, p. 747-767.

——— 1965, The Mineral Resources of the Sea: Amsterdam, Elsevier, 304 p.

Murray, John, and Lee, G. V., 1909, The depth and marine deposits of the Pacific: Memoirs Museum Comparative Zoology, Harvard College, v. 38, no. 1, 171 p.

Murray, John, and Renard, A., 1891, Report on deep-sea deposits, in Thomson, C. W., Editor, Report on the Scientific Results of the Voyage of H. M. S. Challenger During the Years 1873-76: London, Eyre and Spottiswoode, v. 1, 5, p. 1-525.

National Oceanographic Data Center, 1971, Listing of bottom sediment sampling information for all samples which indicate manganese in the surface sediment description, 55 p.

Nikolayev, D. S., and Yefimova, E. I., 1963, On the age of iron-manganese concretions from the Indian and Pacific Oceans: Geochemistry, no. 7, p. 703-714.

Olausson, Eric, 1960, Sediment cores from the West Pacific, in Pettersson, Hans, Editor, Reports of the Swedish Deep-Sea Expedition 1947-1948, v. 6, no. 8, p. 169-214.

Pettersson, Hans, 1957, The voyage, in Reports of the Swedish Deep-Sea Expedition, v. 1, no. 1, p. 1-123.

Revelle, R., Bramlette, M., Arrhenius, G., and Goldberg, E. D., 1955, Pelagic sediments of the Pacific: Geol. Soc. America, Special Paper 62, p. 221-236.

Riley, J. P., and Sinhaseni, P., 1958, Chemical composition of three manganese nodules from the Pacific Ocean: Jour. Marine Research, v. 17, p. 466-482.

Scripps Institution of Oceanography, 1950, MidPac Expedition, R/V Horizon, list of cores and dredge samples, 9 p.

——— 1951, Northern Holiday Expedition, core log, 7 p.

——— 1952-53 Capricorn, 1954 Cusp, and 1954 Chubasco Expeditions, R/V Spencer F. Baird and R/V Horizon, list of cores and dredge samples, 30 p.

——— 1956, Chinook Expedition, R/V Spencer F. Baird, list of cores, 2 p.

——— 1957-1958, Downwind Expedition, R/V Spencer F. Baird and R/V Horizon, list of cores and dredge samples copied from shipboard logs, 28 p.

——— 1959, Fanfare Expedition, list of cores and dredge samples copied from shipboard logs, 6 p.

——— 1960, U.S.C. & G.S. Explorer - 60 cruise, data copied from ship board logs, 6 p.

——— 1960, Southern Borderland Expedition, R/V Spencer F. Baird and R/V Orca, 4 p.

——— 1960, Tethys Expedition, list of cores copied from shipboard logs, 5 p.

——— 1960-1961, Monsoon Expedition, list of cores and dredge samples copied from shipboard logs, 2nd ed., 14 p.

——— 1961, Japanyon Expedition, list of sediment cores, Legs II, IV, and V, 10 p.

——— 1961-1962, Risepac Expedition, list of sediment cores, 11 p.

——— 1962, Hilo Expedition, R/V Stranger, list of cores copied from shipboard logs, 1 p.

——— 1962, Proa Expedition, list of cores and dredge samples copied from shipboard logs, 19 p.

——— 1962-1963, Lusiad Expedition, R/V Argo and R/V Horizon, list of sediment cores and dredge hauls, 28 p.

——— 1963-1964, Amphitrite Expedition, list of cores and dredge samples copied from shipboard logs, R/V Argo, 14 p.

——— 1964, Carroussel II Expedition, list of cores, dredge samples and camera stations copied from shipboard logs, 3 p.

——— 1964, Dodo Expedition, R/V Argo, list of cores and dredge samples copied from shipboard logs, 20 p.

——— 1965, Wahine Expedition, R/V Spencer F. Baird, list of cores copied from shipboard logs, 6 p.

——— 1966, Show Expedition, R/V Argo and R/V Horizon, list of cores copied from shipboard logs, 3 p.

——— 1966, Tripod Expedition, R/V Argo, list of cores and dredge hauls copied from shipboard logs, 3 p.

——— 1966, Zetes Expedition, R/V Argo, list of cores and dredge hauls copied from shipboard logs, 6 p.

——— 1967, Nova Expedition, R/V Argo and R/V Horizon, list of cores and dredge hauls copied from shipboard logs, 18 p.

——— 1968-1969, Circe Expedition, R/V Argo, list of cores and dredge hauls copied from shipboard logs, 20 p.

——— 1968, Styx Expedition, list of cores and dredge hauls copied from shipboard logs, 20 p.

Skornyakova, N.S., and Andrushchenko, P.F., 1964, Iron-manganese nodules in the Pacific Ocean: Litologiya i Poleznyye Iskopayemyye, no. 5, p. 21-36.

——— 1968, Iron-manganese nodules from the central part of the South Pacific: Oceanology, v. 8, p. 692-701.

Skornyakova, N. S., Andrushchenko, P. F., and Fomina, L. S., 1962, The chemical composition of iron-manganese concretions of the Pacific Ocean: Okeanologiya, v. 2, p. 264-277.

Willis, J. P., and Ahrens, L. H., 1962, Some investigations on the composition of manganese nodules, with particular reference to certain trace elements: Geochim. et Cosmochim. Acta, v. 26, p. 751-764.

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COMPILATION: M.PARSONS, L.SUSSILLEAUX
ILLUSTRATOR: V.RIPPON

LEGEND

- TERRIGENOUS
- TERRIGENOUS-TURBIDITES (GRADED DEEP-SEA SAND, SILT, MUD AND CLAY EMPLACED BY TURBIDITY CURRENTS)
- PELAGIC OOZE-BIOGENIC SILICEOUS (NORTHERN ZONE CONSISTS OF DIATOMS COMBINED WITH FINEST TERRIGENOUS FRACTIONS, ICE-RAFTED DETRITUS AND VOLCANIC SILT)
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- PELAGIC OOZE-BIOGENIC CALCAREOUS (FORAMINIFERAL OOZE AND CLAY)
- PELAGIC CLAY (RED AND BROWN CLAY)
- SEDIMENT RELATED TO TOPOGRAPHIC HIGHS (PROPERTIES DEPENDENT UPON DEPTH OF CREST OR SUMMIT: (E.G., LAG GRAVELS AND SANDS, WINNOWED OOZE, LOCALLY DERIVED TURBIDITES AND SLUMPED SEDIMENTS)

TURBIDITES
HEMIPELAGITES
ICE-RAFTED SEDIMENT AND VOLCANIC SILT
TURBIDITES
HEMIPELAGITES
BIOGENIC OOZE,
RED CLAY
RED CLAY
SEDIMENT RELATED TO TOPOGRAPHIC HIGHS
HEMIPELAGITES
BIOGENIC SILICEOUS OOZE
CALCAREOUS

KAMCHATKA
ALASKA
JAPAN
HAWAII
BERING SEA
BERING SEA

• LAMONT-DOHERTY CORING STATION
127 NUMBER OF MARSDEN SQUARE

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WESTERN LIMIT OF NORTH PACIFIC BASIN

MAP 1

WET DENSITY, POROSITY AND MOISTURE CONTENT OF THE SUBSTRATE

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NORTH PACIFIC

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ILLUSTRATOR: V. RIPPON

WET DENSITY g/cc: 1.6, 1.5, 1.4, 1.3, 1.2, 1.1, 1.0
POROSITY %: 95, 90, 85, 80, 75, 70, 65
MOISTURE CONTENT % dry weight: 600, 500, 400, 300, 200, 100, 0

● STATION LOCATION
62 MAP NUMBER

TURBIDITES

HEMIPELAGITES

ICE-RAFTED SEDIMENT AND VOLCANIC SILT

TURBIDITES

HEMIPELAGITES

BIOGENIC OOZE,

RED CLAY

AVERAGE PARTICLE SIZE <1μ

SEDIMENT RELATED TO TOPOGRAPHIC HIGHS

RED CLAY

AVERAGE PARTICLE SIZE <1μ

HEMIPELAGITES

BIOGENIC SILICEOUS OOZE

AVERAGE PARTICLE SIZE 1-2μ

CALCAREOUS

LEGEND

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WESTERN LIMIT OF NORTH PACIFIC BASIN

MAP 5

NOTE CORRELATION BETWEEN FERROMANGANESE DEPOSITS AND SITES OF VERY SLOW DEPOSITION OF RED CLAY AND SILICEOUS OOZE.

FERROMANGANESE
NODULE
CRUST

KAMCHATKA

ALASKA

BERING SEA

BERING SEA

TURBIDITES

HEMIPELAGITES

HEMIPELAGITES

JAPAN

ICE-RAFTED SEDIMENT AND VOLCANIC SILT

TURBIDITES

BIOGENIC OOZE,

RED CLAY

RED CLAY

SEDIMENT RELATED TO TOPOGRAPHIC HIGHS

HAWAII

HEMIPELAGITES

BIOGENIC SILICEOUS OOZE

CALCAREOUS

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WESTERN LIMIT OF NORTH PACIFIC BASIN

SURFACE DISTRIBUTION
FERROMANGANESE DEPOSITS

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MAP 2

140° 160° 180° 160° 140° 120° 100°
60° 50° 40° 30° 20° 10° 0°

IRON, MANGANESE AND CALCIUM CONTENT OF FERROMANGANESE NODULES

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NOTE: DATA ARE FROM A VARIETY OF SOURCES. RESULTS MAY NOT BE DIRECTLY COMPARABLE.

WT. PERCENT
MANGANESE/IRON RATIO
35 30 25 20 15 10 5 0
2.5
0.3
● STATION LOCATION
39 MAP NUMBER

ALASKA
KAMCHATKA
JAPAN
BERING SEA
TURBIDITES
HEMIPELAGITES
ICE-RAFTED SEDIMENT AND VOLCANIC SILT
BIOGENIC OOZE,
RED CLAY
SEDIMENT RELATED TO TOPOGRAPHIC HIGHS
HAWAII
BIOGENIC SILICEOUS OOZE
CALCAREOUS

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WESTERN LIMIT OF NORTH PACIFIC BASIN

MAP 4

140° 160° 180° 160° 140° 120° 100°
60° 50° 40° 30° 20° 10° 0°

NICKEL, COPPER AND COBALT CONTENT OF FERROMANGANESE NODULES

SEDIMENTARY PROVINCES

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NOTE: DATA ARE FROM A VARIETY OF SOURCES. RESULTS MAY NOT BE DIRECTLY COMPARABLE.

WT. PERCENT
3.0
2.5
2.0
1.5
1.0
0.5
0
NICKEL
COPPER
COBALT

● STATION LOCATION
63 MAP NUMBER

ALASKA
KAMCHATKA
JAPAN
BERING SEA
TURBIDITES
HEMIPELAGITES
ICE-RAFTED SEDIMENT AND VOLCANIC SILT
BIOGENIC OOZE
RED CLAY
SEDIMENT RELATED TO TOPOGRAPHIC HIGHS
HAWAII
BIOGENIC SILICEOUS OOZE
CALCAREOUS

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WESTERN LIMIT OF NORTH PACIFIC BASIN

MAP 3

140° 160° 180° 160° 140° 120° 100°
60° 50° 40° 30° 20° 10° 0°